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MARINE ENGINEERING OF CANADA

Vol. IX. No. 1

Subscription price in Canada, $2.00 per year

A monthly journal dealing with the progress and development of Merchant and Naval Marine Engineering.

The MacLean Publishing Co., Limited, Toronto, Canada, January, 1919

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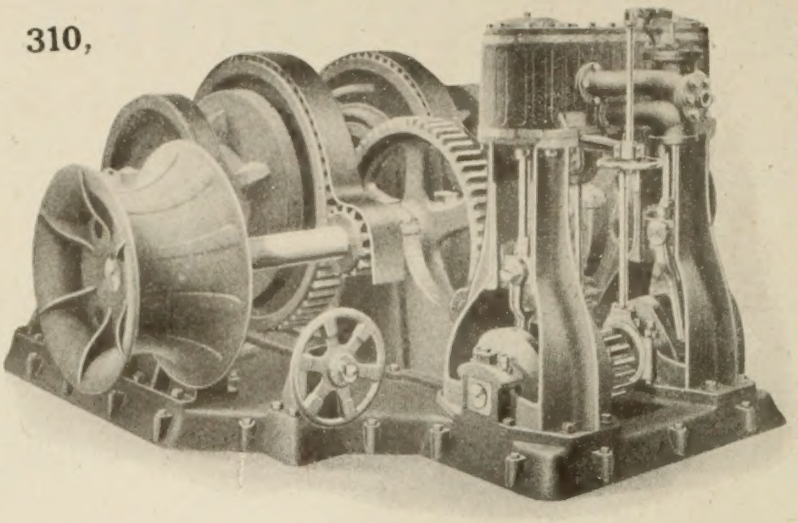
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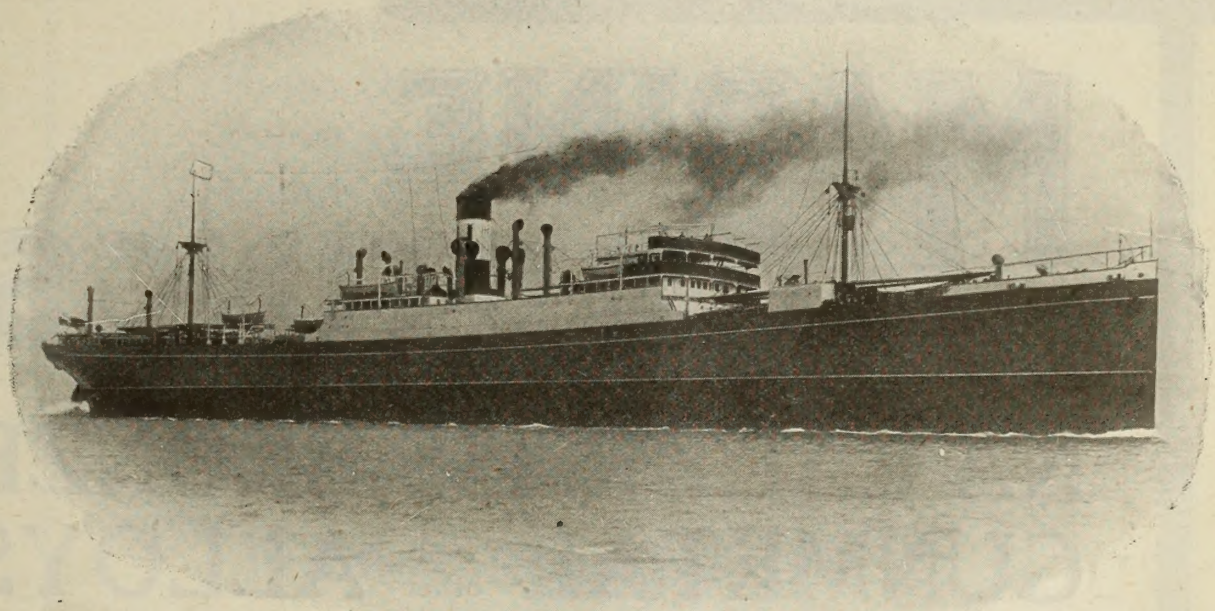
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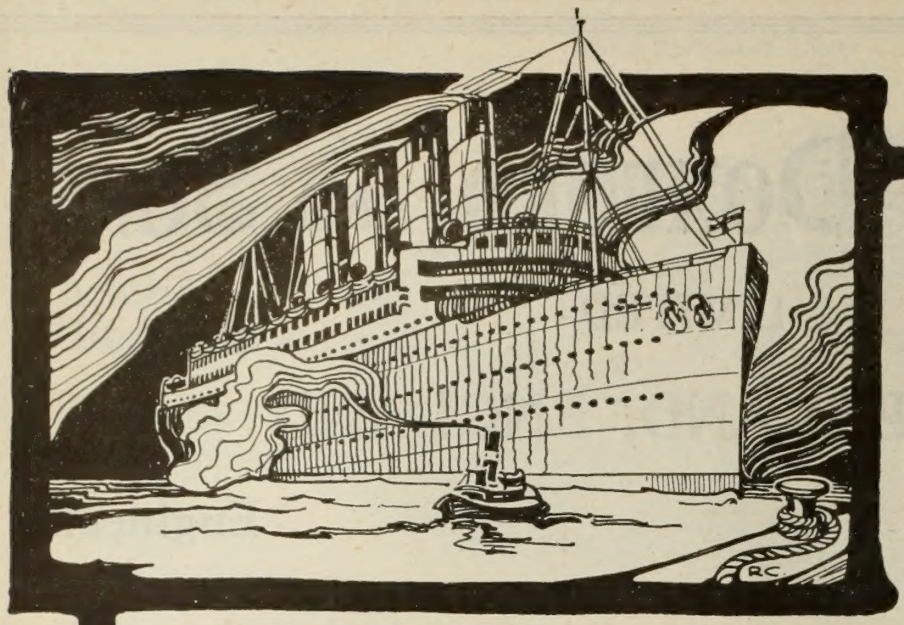
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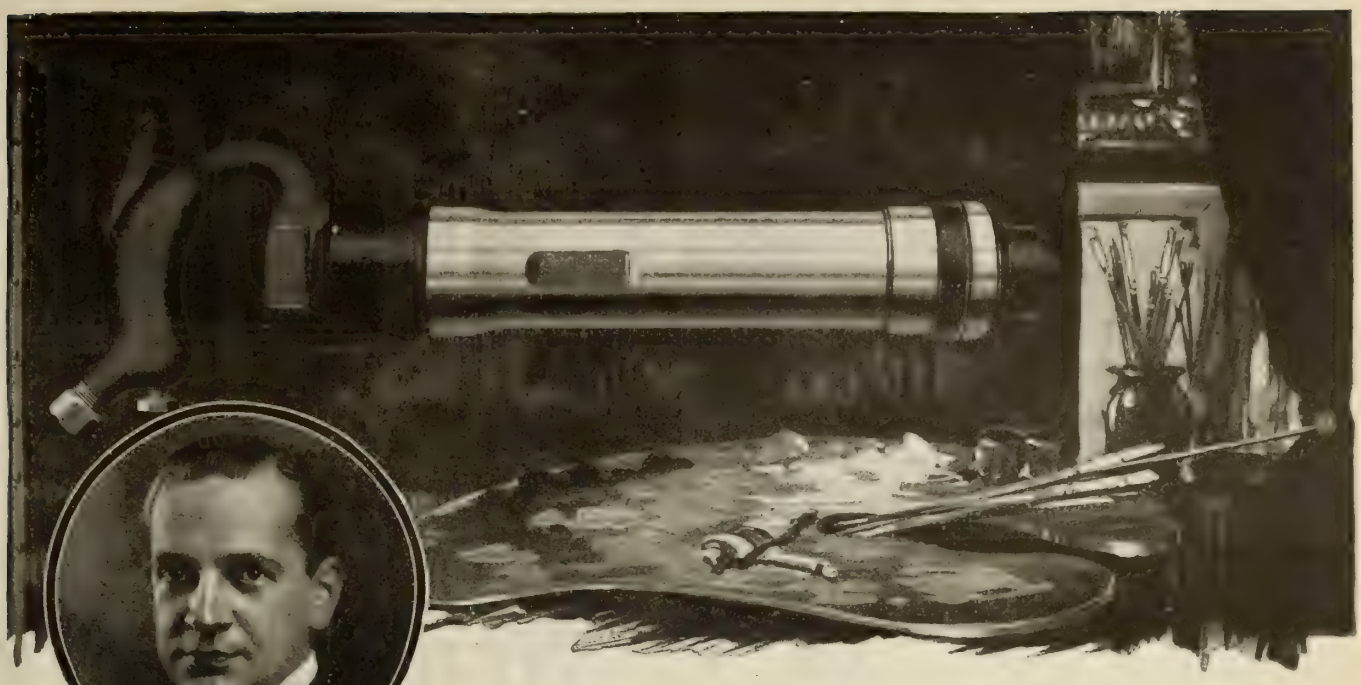
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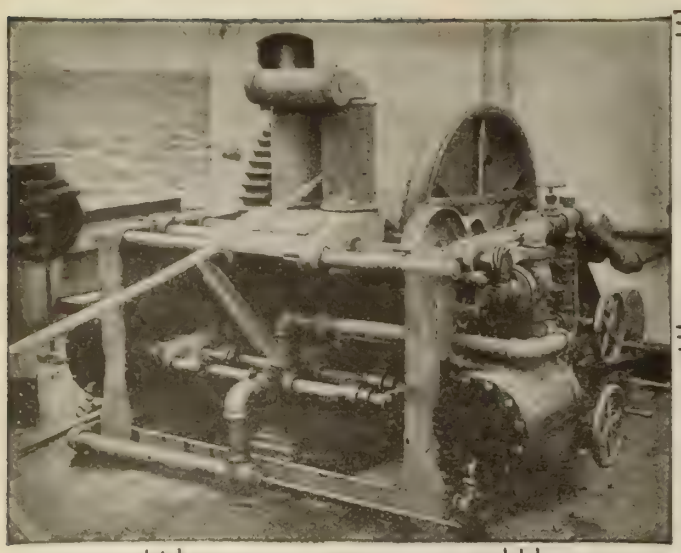
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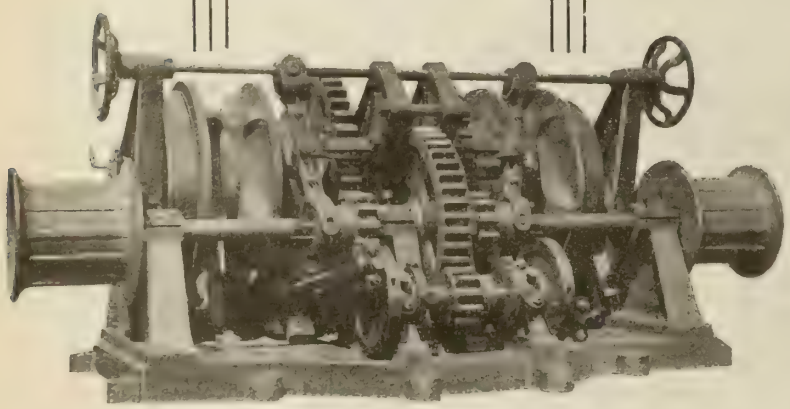
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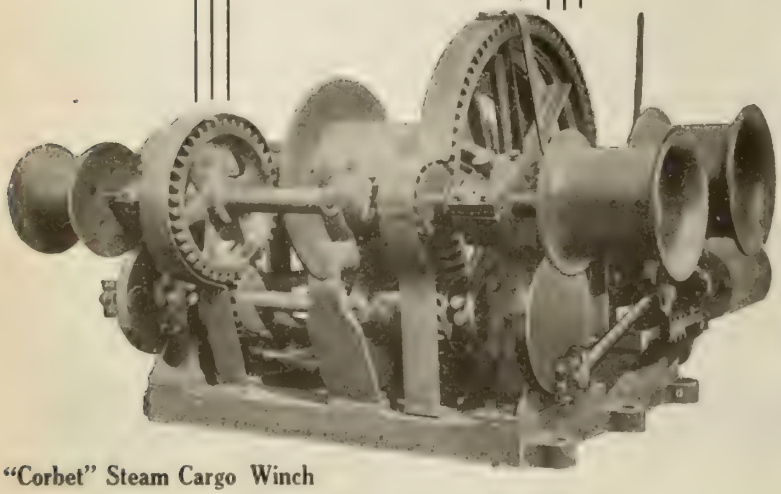


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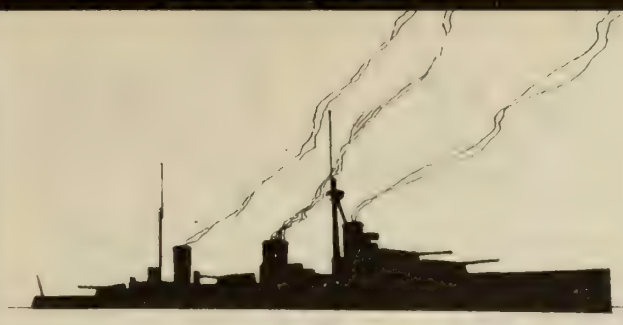
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The Publisher's Page

TORONTO JANUARY, 1919

Mighty Facts Are On The Blackboard

And the Chalk is in Your Hand

But it is vastly more difficult to add Facts correctly than to add figures. Were it not more difficult, would there be the disparity in the division of material wealth there is? Perhaps there would be. Because in computing Facts we cannot turn to the adding machine to verify our answer. Without courage to act on the conclusion drawn by our own intellect, the opportunity goes by—we fail.

Just what are the big, vital, mighty Facts confronting us?

Our manufacturers produced 65,000,000 shells. Confident they can produce peace products on a similar scale, they are wisely co-operating to make a determined drive for export trade. Already six groups have been formed and these have, or will have, special representatives in England, France, Belgium and other foreign countries. Moreover, in the Canadian Trade Mission now abroad are capable business men. We see their work, or we think we do, in the $40,000,000 order for lumber just recently placed in Canada.

Four years ago there were less than 50 shipyards in Canada. To-day, approximately 200 Canadian yards are building ships, large and small.

In less than four years our shipbuilders have launched more than 30 steamers of over 1,000 tons capacity for registry in Canada. In addition, they have built for the Imperial Munitions Board 43 steel ships and 58 wooden ships with a total deadweight capacity of 360,000 tons; for private owners, 14 steel vessels with a deadweight of 62,400 tons and 8 wooden vessels with a deadweight of 17,800 tons; for the Imperial Government and the Government of France, 586 submarine chasers.

Over and above 11 steel ships, aggregating 48,000 tons deadweight, already constructed and launched for the Marine Department of our Government, contracts for a further 39 have been let. Truly, Canada's Merchant Marine is rapidly becoming a reality.

A close estimate of ships now building and on order in Canada conservatively places their value at $113,000,000. And that is only a start—a beginning made in the face of tremendous difficulties. Think, then, and think hard, of the future of Canadian shipbuilding.

As for us, we believe that we can see "plus signs" in the foregoing Facts. We have added one to another—big, vital, mighty Facts—and confident of our answer, we have had our sleeves rolled to the elbow for months.

Canada is going to have a great, permanent shipbuilding industry. She is going to have, in fact she has with this issue, a greater MARINE ENGINEERING OF CANADA—a paper even more admirably ready to serve helpfully business men and workmen building ships and operating ships.

This Great Lakes Number is a sample of the treat ahead. The British Columbia Number for February, will give you important particulars of all the principal yards on the Canadian Pacific coast. The Eastern Canada Number for March will deal with the yards east of Lake Ontario and in the Maritimes. In both these coming Feature Numbers "close up" stories of the men themselves—the owners, superintendents and foremen—will capture your interest and hold it.

Big, vital, mighty Facts are on the blackboard. Add them up!

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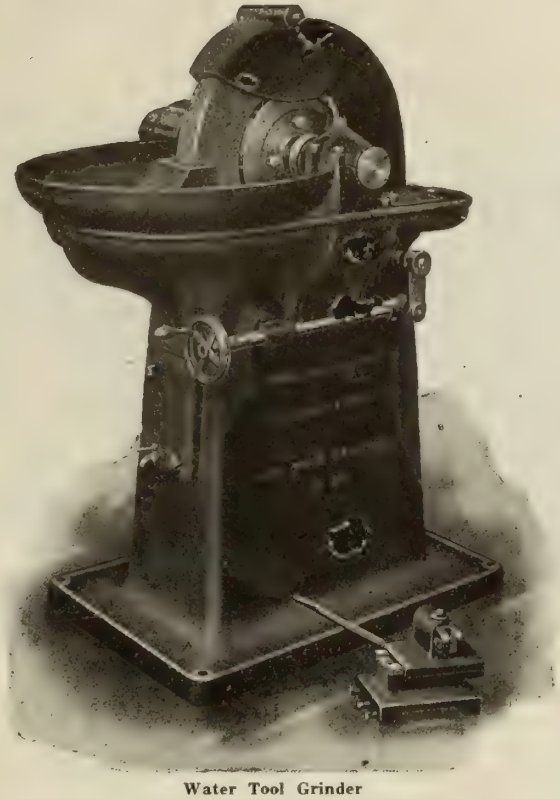
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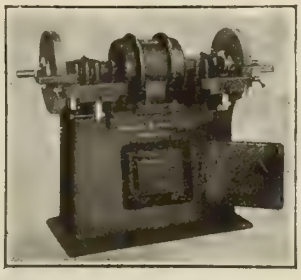
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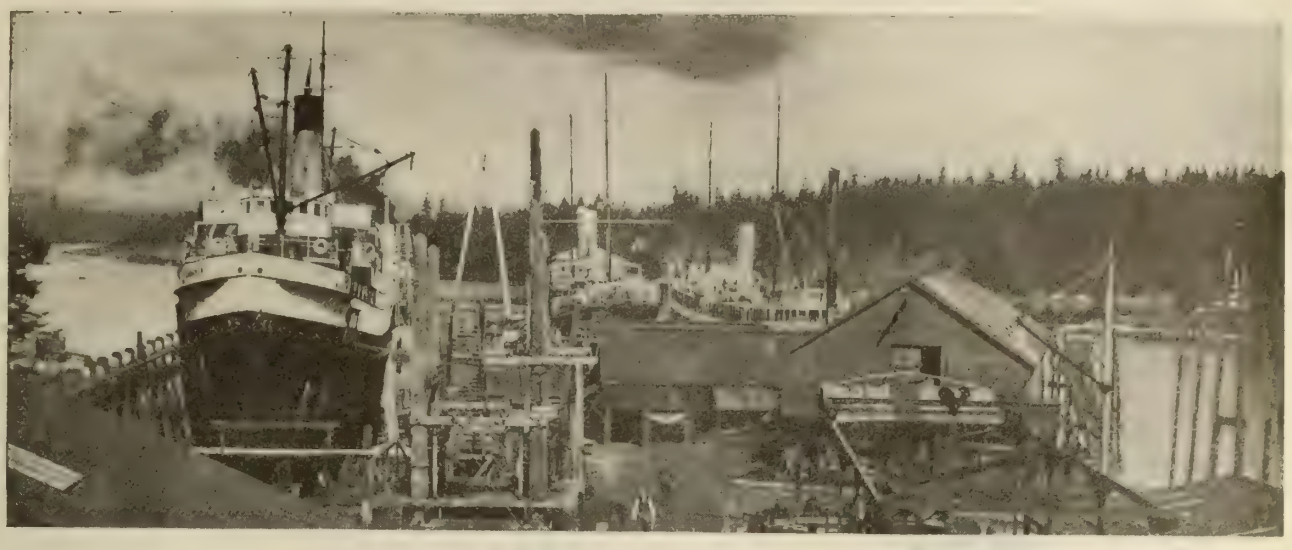
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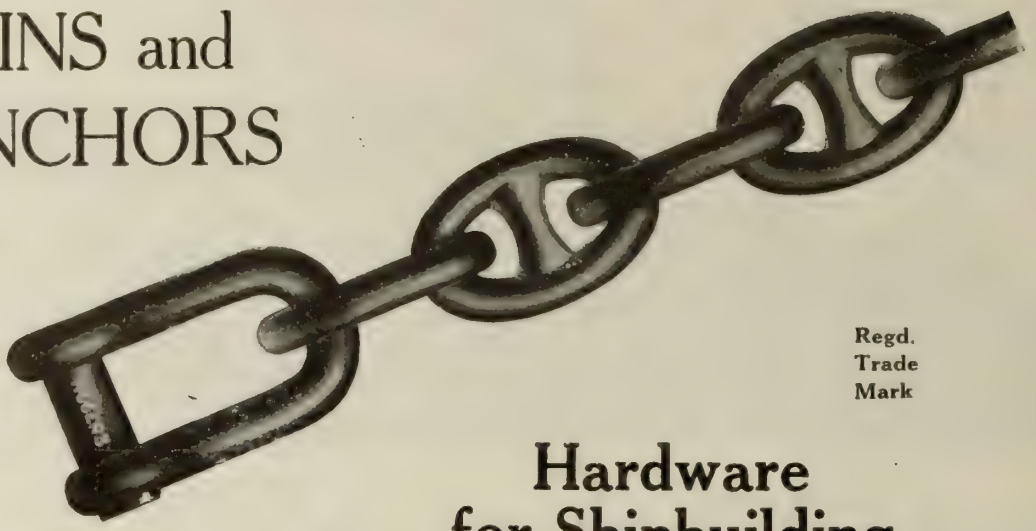
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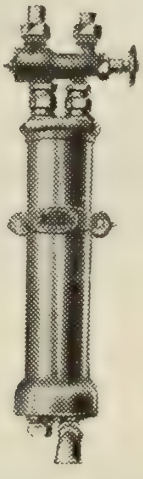
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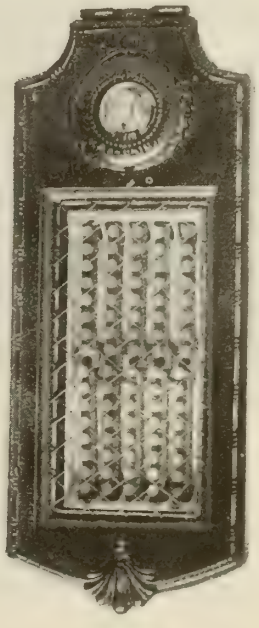


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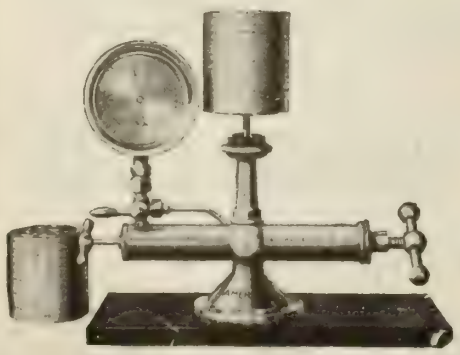
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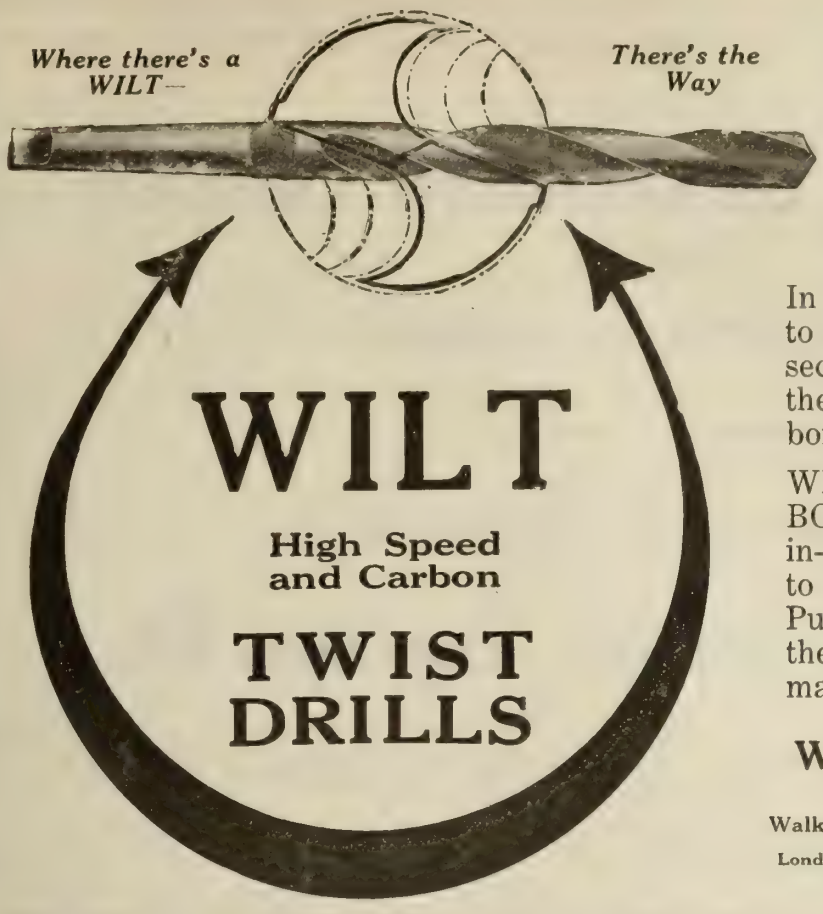
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MARINE ENGINEERING
of Canada

Volume IX TORONTO, JANUARY, 1919 Number 1

Great Lakes—Pacific—Atlantic

SHIPBUILDING was a well-established industry on the Great Lakes long before there was war in Europe. It cannot be classed as a war industry, although it must be admitted that during that period of the war, when the resources of the Allied nations were strained to defeat the aims of the Hun, shipbuilding in Canada received a very considerable impetus, the effects of which will be felt in the various yards for some months to come.

The January issue of MARINE ENGINEERING is devoted almost exclusively to the activities on the Great Lakes. This will be followed in February by an extensive review of the work that has been carried on in British Columbia, while in March the work of the Maritime Provinces will be reviewed.

Thomas H. Fenner, of the editorial staff of MARINE ENGINEERING, made the trip to the shipyards on the Great Lakes in order to secure first-hand information regarding the progress of the work being carried on, and also to ascertain the possibilities of work there for the coming summer.

The shipbuilding programme on the Great Lakes was not heralded with as great a blast of trumpets as some of the other programmes planned for this continent, but it is worthy of note that the launchings were on schedule and the vessels passed inspection.

There have been serious handicaps for the shipbuilders to meet during the past season. There have been problems of supplies and problems of labor, and it is safe to say that the latter have been by far the hardest to solve. Prospects for the coming season are better, but the great need is for trained men. The yards have been carrying on under a big handicap.

There is room for some arrangement between the yards regarding the labor problem. It is not fair that yards that take green men and train them shall have them coaxed away as soon as they are worth something to the yards. We do not say that this is the practice of the yards throughout, but the habit of continually offering a man more money has that trend in a very certain way.

It really means that some of the yards will be doing training of green help all the time, and that others will come along and reap the benefit after the man has become worth something in the business. It is not our intention to urge that there should be a barrier put up to prevent a man selling his services to the highest labor market, but we do make the claim that the training operation, which often entails the time of a foreman and the paying of a man during a time when he may be unproductive, should not be relegated to a few of the yards. A little co-operative action on the part of the builders would distribute the burden of training more evenly.

There has not been a large shipbuilding population in Ontario. Nearly all the yards have felt this to their disadvantage. It has too often been a case of constant supervision on the part of the foremen and others in charge of the work.

The securing of steel plate was another serious matter for several of the yards during the greater part of the year, and there were many cases where it looked as though operations would have to be curtailed. In very few cases, though, did conditions come to the point where serious delays were occasioned. The business was war work of the greatest importance, and the priority ratings were consequently high. It is certain that the securing of a large supply of ship plate on a prompt delivery schedule will be of considerable benefit and importance to the industry on the lakes. Whether the companies will be able to take advantage of the lowering of prices at once is not known, as they may have contracts running well into the future.

There will always be a good demand for the lake carrier. This industry will be living and doing well long after the shipbuilding that owes its origin entirely to war conditions has died down and been forgotten. As the country grows and develops there should be more and more demand for the lake vessel. It can be built on the Great Lakes at a price that will meet foreign competition. To build them abroad means that they would have to be cut and joined after being brought through the canals, and this expense makes the building of them abroad almost out of the question. In this connection it must also be remembered that the biggest lake freighter was a product of Canadian yards.

Port Arthur a Busy Shipbuilding Centre

During the Stress of the War a Great Deal of Work Has Been Turned Out of the Yards at the Head of the Great Lakes— Engines and Boilers Turned Out in the Same Place

IT must have been somewhat disheartening for the Germans to feel that their best efforts at removing the British mercantile marine from the face of the waters was, in part, being met by contributions of new tonnage, built in perfect security from any danger but that of the bomber or incendiary. Even this danger was discounted by careful vigilance, and ships were built, launched, and dispatched with speed and security from various yards situated considerably over 1,000 miles from the farthest inward reach of salt water.

The Port Arthur Shipbuilding Co., situated at the head of Lake Superior, is among the largest and most efficient of these yards, and has made some notable contributions to both deep sea and lake tonnage. As an example of what this yard is capable of producing, the W. Grant Morden stands out boldly. This vessel, a photo of which, under construction, appears in this article, bears the distinction of being the largest freighter built on the Lakes. Her dimensions are equal to those of a large ocean liner, being 625 feet in length, 59 feet beam, and 32 feet depth, with a deadweight carrying capacity of 13,000 tons. She was built in 1914.

The yard was first laid down in the year 1911, and was known as the Western Shipbuilding Co. In 1912 it turned out two scows of 726 tons gross, the lake freighter "Hamilton," 257 feet long, 42 ft. 6 inches beam, and 26 ft. 6 in. depth, of 2,346 gross tons, and the excursion steamer "Nasookin," 200 feet long, 40 feet beam, and 8 feet depth. In 1913 only one vessel was built, the "Calgarian," 257 feet by 42 feet 6 inches by 26 feet 6 inches, and 2,326 gross tons. In 1914, besides the W. Grant Morden, already mentioned, two passenger steamers, the well-known "Noronic," 385 feet long by 52 feet by 28 feet 9 inches; the "Sicamous," 200 feet by 40 feet by 8 feet; one small excursion steamer, one ocean-going tug, and two smaller tugs were built. With the outbreak of war, the plant, like so many others, turned its activities into the shell-making field, and while engaged in this field, manufactured 45,000 eighteen-pound shrapnel, and 35,000 eighteen-pound high explosive shells.

When the loss from submarines began to make itself felt, making new ships a prime necessity, every available yard was impressed into the service. The company was reorganized and named the Port Arthur Shipbuilding Co., and in 1916 building was commenced for the Imperial Munitions Board, and two steamers of the regulation canal size were turned out, the "Thorgerd" and "Blaamyra," of 4,300 tons d.w., 261 feet long by 43 ft. 6 in. beam, and 28 feet 2 inches depth. In the following year, two canal size freighters, and four trawlers, each 125 feet by 23 feet four inches by 15 feet 1 inch were built. The plant by this time was on a well-organized basis, and the year 1918 saw a great increase of production, no less than six canal-sized freighters and six trawlers being turned out, twelve vessels in all. There are at the time of writing two of the Canadian Government's new programme ships on the stocks, with four more to be laid down; two trawlers at the fitting out basin, nearly completed, and two trawlers on the stocks.



TRAWLERS BUILDING, PORT ARTHUR

The Building Berths

The building berths are arranged on each side of the dry dock, extending the full length of the dock. They are 700 feet long, and two full canal-size steamers can be laid down on each at the same time. The berths one side of the docks are served by a travelling crane, mounted on trestles running the full length of the berth. On the other side the berths are served with three trolleys on cable ways, with a longitudinal span of 700 feet. The plate and shape shop opens out directly onto the building ways, and a large bull riveter is located at the ends of the ways nearest the shop, to handle the fabricating of parts not dealt with in the shops. The trawlers are laid down side by side, their smaller beam making this possible. All vessels are launched directly into the dry dock. After launching, the dock is emptied and all hulls undergo a thorough examination before being completed. Fitting out is carried forward as far as possible before the vessel is launched, so as to occupy the minimum time between launching and delivering.

The Graving Dock

The graving dock is commodious enough to take in the largest vessels in use on the lakes. It is 717 feet long, by 95 feet wide, and a depth of 16 feet 6 inches over the blocks. The pump house is situated at the lake end of the dock, and the pumping equipment consists of two 30-inch centrifugal pumps, and one eight-inch centrifugal pump. They are driven by direct connected Westinghouse D.C. motors, the 30-inch pumps having each a 220 volt 200 h.p. motor, while the 8-inch pump is handled by a 30 h.p. motor of the same make. These pumps can empty the dock in 3½ hours with no ships in, and of course in less time when the dock is occupied.

The Plate Storage, Mold Loft, Plate Shops

The main lines of the Canadian Pacific and Canadian Northern Railways run along the upper, or shore end of the yard, and sidings deliver the plate

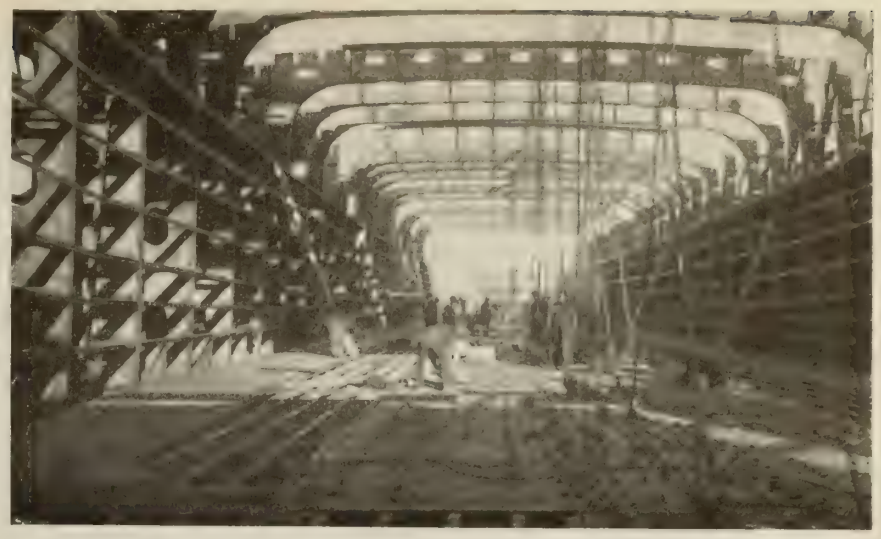
and shape steel direct to the storage. This building is at the end of the plate shop, and is 280 feet long, by 150 feet wide. One side is devoted to plates, and the other side to angles, channels, and all the various shapes used in ship construction. Each side is served by two 10-ton electric cranes, running the full length of the shops. The material from the storage sheds has a straight run through the shops till it comes out on the building ways, and there is no turning back for any operation. The mold loft is situated above the punch shop, and is long enough to lay out a full length canal-sized vessel. The plate and shape shops are well equipped with machine tools, including an electric welding and oxy-acetylene welding outfit. The plate and shape furnaces, with their bending slabs, are situated in a bay on one side, and here also is a rivet and shim furnace, and an Acme riveting machine, which can turn out from 35 to 40 rivets per minute. The angle and plate furnaces are being replaced at the present time by oil burning furnaces, made by the Canadian Incinerator Co., Toronto. The tools in the punch shop include a plate planing machine to plane 32 feet, made by John Bertram & Sons; bending rolls, 18 feet by ⅝″, made by Wickes Bros., Saginaw, Mich. Single end shearing machine, 48″ throat, by London Machine Tool Co., and three single end punches by the same maker. A 48″ single end punch, 8 x ⅞ plate rolls, 38″ throat shearing, 48″ throat punch, and horizontal punch, all Hillis & Jones, Wilmington, and double angle shear, Bertram & Sons, and various other tools, including three post drills.

The end of the punch shop nearest the building ways is devoted to fabricating, floors and margin plates being built up here before going out to the yard.

Engines and Boilers

The company build all engines and boilers for the ships they construct, and practically everything else connected with the ship, with the exception of the deck machinery. They build steering gears also. This necessitates a very complete engineering plant, and the quality of the work turned out is excellent. There is considerably higher finish to the product than one would expect to find in a shop turning out material practically against time, and the attention paid to detail where it is necessary, indicates the presence of men experienced in the practical refinements of marine engineering. The finished engine presents a mostly pleasing appearance, and the care expended earns its own reward in the absence of trouble when put into operation.

The layout of the engineering plant compares with that of the shipbuilding end, in that there is a constant progression from pattern shop to ship. The pattern shop is a new two-storey, fireproof building, containing the shop itself on the lower floor, and a storage upstairs. It is well lighted, and well equipped with all necessary tools. The outgoing end of the pattern shop faces directly onto the foundry entrance, and is distant only a few yards. The foundry contains two cupolas, of 5 and 7 tons capacity, and is served by two electric cranes. There are three ladles, of two, five and seven tons capacity for different size jobs, and a large core oven. In the corner, back of the core oven, are situated the brass furnaces. The cylinders are cast in loam molds and the bedplates are made in two pieces. Losing a casting is a rare thing in this foundry, and the staff are justly proud of their success. The writer was shown a curious product of the molder's art, consisting of a cup, a saucer and spoon, cast in one piece, and made without a core.



THE "W. GRANT MARDEN," SHEWING ISHERWOOD CONSTRUCTION

The Machine Shop

Closely contiguous to the foundry, and communicating by rail, is the machine shop. This shop, 180 feet long, by 90 feet wide, is very completely equipped. The end nearest the fitting out basins is used for the erecting shop, and the finished engines can go out direct to the shear legs, or if they are to be installed in the hull while still on the stocks, a track leads to the building ways. Among the larger machines noticed were a 5′ x 5′ planer, with a 52-inch by 14 feet platen, made by London Machine Tool Co., and a four-foot horizontal boring machine, and 20″ by 14 feet engine lathe, by McKechnie & Bertram. A 24″ x 12′ engine lathe, by John Bertram, and the usual complement of speed lathes, drills, etc., necessary, including a large slotting machine. All the larger machines are equipped with direct individual motor drive.

Forge

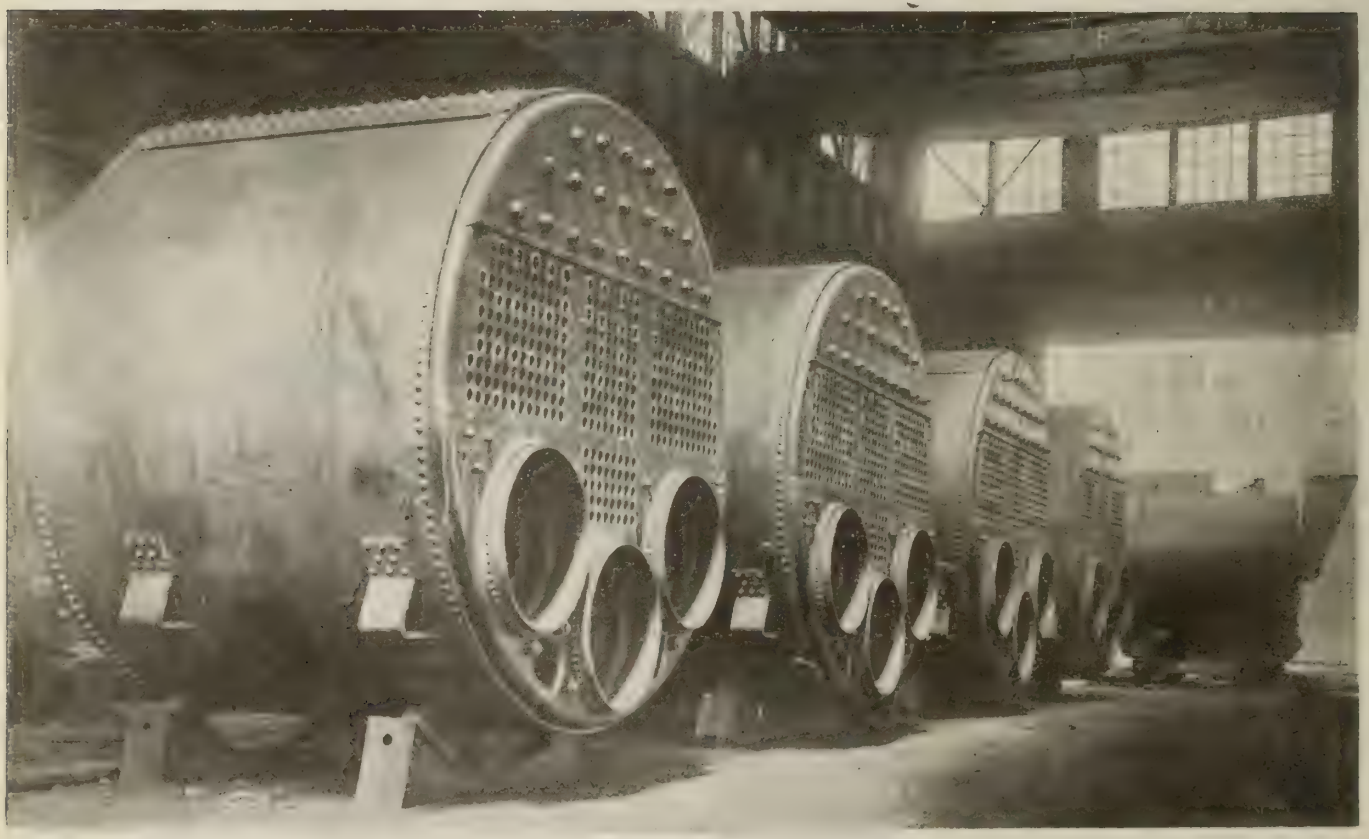
The forge shop, where all the connecting rods, eccentric rods, and smaller forgings are made, is a 50 feet by 100 feet building, containing 10 fires and two hammers, 12″ x 36″. It is situated



LAYING INNER BOTTOM PLATING, PORT ARTHUR SHIPBUILDING CO



"WAR OSIRIS." CONSTRUCTION OF TOP DECKING



MARINE BOILERS, PORT ARTHUR

conveniently to both machine shop and boiler shop, and the pipe shop and coppersmith's shops abut at one end. The pipe shop contains an eight-inch and two four-inch threading machines as well as the usual bending tools, and a twenty-inch vertical drill.

Boiler Shop

The boiler shop is a one-storey, 90 feet by 180 feet building. It contains every machine necessary to the production of a well finished marine boiler. At the time of writing one twelve-foot diameter boiler for the trawlers was in the completing stages, and one about half completed. The output this shop is capable of is about 2 per month. The trawler boilers are fitted with plain furnaces, it being impossible to obtain the corrugated type. They are made with a butt strap joint, and a feature of their construction is that the strap does not continue the full length of the furnace, but finishes off about four inches from each end. The remaining space is finished up by electric weldings. This construction eliminates joining together of three thicknesses, that is, the shell, furnace tube, and butt strap. It makes a very neat finished job. The attention to detail noticed in the other departments is also manifest here. The flanges for receiving the manhole doors are planed perfectly true, which allows a watertight joint to be made in the manhole door without any trouble. All plates are finished on the edges after shearing, so that they come together perfectly, and present a smooth surface for caulking. The riveting is done by a 100-ton hydraulic riveter, with a 10'-6" gap. Hydraulic pressure is maintained by a 10'x10' hydraulic accumulator made by R. D. Woods, Philadelphia. There is an independent air compressor for supplying the air tools, 8" x 8" x 12", steam driven. A multiple four spindle drill with 12' table, and a three spindle horizontal drilling and boring machine take care of the drilling requirements. There is a vertical plate rolling machine, motor driven to take plates up to 12 feet in width, and bending rolls 8' x 5/8". A 12-foot post drill is also installed. Punching and shearing machines, and a 16" x 14" lathe complete the equipment of this shop, and the boilers turned out are A1 specimens of this branch of engineering manufacture.

Other Buildings

There is a large and well stocked store room, wherein are kept all the smaller articles of a ship's outfit, such as cast iron and brass valves, pulley blocks, packings, etc. At one end of this warehouse is a very modern first aid room, with a doctor in attendance. Conspicuous on one wall of this room is the modern equivalent of a straight jacket, made of light expanded metal, for the purpose of picking up an injured man from any position where he has to be hoisted. This apparatus completely enfolds the body and holds it rigid, so that broken bones or wounds will not be aggravated in the inevitable handling. Fortunately this is not often used, as safety first is rigidly enforced. A joiner shop, where all the fittings for berths, bridge ladders, etc., are made, a paint and oil storage, and an electrical repair shop, are all in evidence. Another important department is the air tool storage, where all air hammers, drills, etc., are stored and repaired when necessary. There are a matter of 150 hammers and 50 drills, of which latter five are electric, so the repair men are kept well occupied.

The Power House

Power is received from the transmission lines and connected to three 350 H.P. induction motors. These in turn drive the D.C. generators, consisting of 3 250 k.w. D.C. generators, 250√1,000 amperes each. These supply current for the yard, and also for driving the air compressors situated in the power house. There is one 14x9x12 Ingersoll Rand, one 48 in. x 12 in. Rand, and two 12 in.x 18 in. Rand air compressors. The power house is a one-storey brick building, 50 feet by 90 feet. There is also a 500 H.P. Scotch marine boiler for heating purposes.

The Social Side

All work and no play makes Jack a dull boy, is an old saying, and the management take this into account. Therefore, we find a hockey team one of the features of the organization, and furthermore, a brass band is in process of organization to speed them on. A very well-kept little rink adjoins the office, for the use of the office staff. A very efficient restaurant serves daily lunches in the basement of the office building, to the excellence of whose meals deponent can testify. There is a pleasant spirit of co-operation among all the department heads, and each one is thoroughly imbued with the feeling that he is associated with a first class concern. That way lies good work.

Mr. James F. Paige

The general manager of the plant, Mr. James Fraser Paige, is an engineer of long experience in marine work. He is a Nova Scotian by birth and was educated partly there, and later in London, England. He served his apprenticeship with the Truro Foundry and Machine Co., Truro, N.S., afterwards gaining experience as machinist and erecting engineer with the Brown & Sharpe Co., Providence, R.I., and the Perth Amboy Shipbuilding Co., New Jersey. He then put in four years as junior and chief engineer on the steamers of the Dominion Atlantic S S. Co. to Yarmouth, N.S., and two years with Quebec Steamship Co., New York. He joined the staff of the Fore River Shipbuilding Co., Quincy, Mass., as assistant to the general superintendent in 1904, and remained with them till 1916, when he joined the Port Arthur Shipbuilding Co. During 1908-9 and 1911 he represented the Fore River Co. in Japan, supervising the installation and operation of the Curtis turbine in Japanese battleships, and in 1912-13 acted in the same capacity on cruisers of the Royal Italian Navy. He is a member of the Society of Naval Architects and Marine Engineers, and American Society of Mechanical Engineers.



J. F. PAIGE

Midland Is an Important Lake Point

Midland Shipbuilding Co. Has a Well-Equipped Yard—Many of the Lake Craft Are Tied Up at This Port For the Winter—Good Equipment Has Been Installed in the Shops

AS Port Arthur lies at the extreme western end of Lake Superior, so Midland lies at the eastern end of Lake Huron, on the Georgian Bay. One's first glimpse of the bay from the train, coming into Midland, conveys the impression that here is a favorite winter haven for a considerable part of the Great Lakes carriers. Numbers of large-sized steamers, of the unmistakable type indigenous to the lake, lie at their moorings in tiers, waiting for the coming of spring to resume their activities. In preparing them for their summer trade, by necessary overhauling and repairs, the plant of the Midland Shipbuilding Co. finds scope for its abilities as well as in the building of new vessels.

The yard is situated right on the Grand Trunk line coming into Midland, and a spur runs into the yard for the delivery of the raw material in the shape of ship plates and sections. Entering the yard, the most prominent object in sight is the gantry crane, standing out boldly above the lesser objects in sight.

The Gantry Crane

This crane is a fine piece of work, and for convenience and speed in handling medium heavy objects, such as fabricated parts of hull construction, could hardly be surpassed. It stands, from the ground to the deck of the traveller, about fifty feet clear. It is of the type known as double cantilever, and has a span of about 150 feet transversely. Its travel longitudinally is limited only by the length of the rails laid down, and can be expanded as required. The transverse span is long enough on the water side to reach over the ways, and a ship lying in the fitting out basin. Of course its lifting capacity at the extreme end of the cantilever arm is limited to about five tons, the weight capable of being lifted increasing as it nears the supporting column to twenty tons; on the shoreward side it reaches in to cover the fabricating benches in the yard, so that it can pick up a piece from the ground and run it to any part of the ship needed, either on the ways or in the basin.

Its longitudinal speed of travel is about 300 feet per minute, and the transverse somewhat greater. It is controlled by four independent motors, two of them for longitudinal traverse, one for transverse traverse, and one for lifting. Current is taken from the Hydro-Electric power lines.

The crane was designed by the E. Poland-Miller Co., consulting engineers, of Cleveland, Ohio, and the building was carried out by the Sarnia Bridge Co., Sarnia, Ont.

For putting the engines and boilers on board the ships after launching, a sixty-ton crane mounted on a dredge is used.

There are two building berths long enough to take two canal-sized ships at once; that is, about 560 feet over all. The gantry crane runs on the inside of the berth, no rail being necessary on the outside of the ways. There are two vessels laid down at the present time, one with keel and main keelson in place, and the other completely framed and partly plated. There is also a large lake freighter undergoing extensive repairs lying in the basin. The two ships building are part of a contract for the Imperial Munitions Board, the first one, the "War Fiend" having been delivered before the close of navigation.

Forge and Plate Shop

The forge shop, plate and angle-bending furnaces and forming slabs are situated at the extreme west end of the yard. The plate and angle furnaces are oil-burning, the furnaces themselves having been built by the company and fitted with Rudel-Belnap burners. The angle furnace is circular and long enough to handle the longest shapes dealt with. The forge contains the usual hand blacksmith fires, with wall swing cranes to handle the material, and a steam hammer, made by John Bertram & Sons, Dundas.

Punch Shop

The punch shop is situated in the middle of the yard, the plate storage being at the side nearest the railway. A three-ton travelling crane, built by John Hepburn and Co., Toronto, is installed for handling plates from the storage to the shop. On the far side of the shop, between it and the building ways, is a space devoted to fabricating, and the gantry crane cantilever runs over this space. The shop itself is well arranged for handling the work. The heavy punching machinery is arranged in the centre, and on the side are the wall drills and plate-bending rolls. The principal machines are three Cleveland double-ended punch and shear machines, one double-ended Wickes punch, and one horizontal angle punch. At the extreme end of the shop and facing outwards, is a Bertram & Sons' angle shear arranged so that long angles can be handled outside the shop direct from the storage. The mold loft is on the second storey over the punch shop, and has ample space to meet the requirements of the work.

The Machine Shop

The company do not build engines or boilers, but purchase these from the



THE DOUBLE CANTILEVER GANTRY CRANE



GENERAL OFFICE MIDLAND SHIPBUILDING CO.

John Inglis Co., Toronto, therefore their accommodations are small. There is, however, a well fitted up machine shop situated in the same building as the punch shop and at one end of the same. This is used as a general tool room and pipe shop. There is a 16 in. swing Hendey lathe, six feet between centres, a Cisco 19½ in. swing by 7 ft., and a C. M. C. lathe 32½ in. by 8½ ft. A 22 in. vertical drill and 24 in. shaper are included, while an 8 in. Landis pipe machine takes care of the pipe threading and cutting. There is also a bolt and staybolt cutter. There is also in a part of the machine shop fenced off, the air compressors for supplying the various air tools used in the plant. These are, one Ingersoll Rand air compressor 28 ins. by 17 ins. by 24 ins., running at 140 revs. per minute, and capable of supplying 2,500 cubic feet free air per minute at 100 pounds pressure, and one 16 in. by 10 in. by 14 in. compressor of the same make. The large machine is driven by a 450 h.p. Canadian Westinghouse induction motor through a 42 in. Sadler and Haworth belt. Current is supplied by the Hydro-Electric Commission at 2,200 volts, 60 cycle, 3 phase.

Started as Dry Dock

The company was first formed as the Midland Dry Dock Co., in January, 1913. The intention at that time was to build a dry dock and carry on a repair business. Other plans prevailed and the dry dock was not built, but the company carried on building tugs and scows of steel, and doing general repairs. This continued until June, 1917, when the company was reorganized as the Midland Shipbuilding Company. They received contracts from the Imperial Munitions Board for six canal-sized steamers, that is 261 ft. by 40 ft. 6 ins., by 23 ft. 6 ins. deep. Of these the "War Fiend" has been delivered and two more are on the stocks. The general manager of the company is Mr. James Wilkinson, a practical shipbuilder. Mr. Wilkinson came from Scotland, as so many of our shipbuilders and engineers do, and after some years in the States, came to Canada in 1911.

The company is well situated and equipped to take a large share in the shipbuilding and marine engineering activities on the Great Lakes, and the next few years should provide ample scope for these activities to all who are engaged in them.

MORE ABOUT TIDES

IT is well to remember the tides as an undulatory motion, then the rising and falling may be more easily understood. In this respect we find that coast gales can pile up a tide or again retard it according to the result of the wind force. The barometer also has its little say in tides, inasmuch as that weigher of the atmosphere denotes what pressure is lying on the bosom of the waters. Thus the lighter the air or the lower the barometer, the higher the tide will be. Or when the barometer registers high the water will be correspondingly low. This effect is not known with any great accuracy, but is mentioned here as still another evidence of the complex study which underlies our topic with its far reaching importance to the navigator. Tide data would appear to say that when the barometer falls one inch the water rises a foot and a half. Again, if the barometer rises the water falls. We know of course, that the mechanical engineer acts on similar natural laws in connection with vacuum.

Sunken Food Cargo Reclaimed. — James Playfair, of Fort William, is making an effort to salvage almost the entire cargo of the steamer "Congdon" this fall, by pumping up the wheat of which the cargo consisted, and having it cleaned and dried in a local elevator. Sixty thousand bushels have already been reclaimed and N. M. Paterson has made the successful experiment of drying the grain thus salvaged. The method employed is hydraulic pumping, the wheat and water being pumped into derrick scows which permit the water to run off while the wheat is retained. No attempt will be made this winter to raise the ship, but should she remain in place for the winter months an attempt will be made early in the spring. In the gale which developed while the ship was stranded on Canoe rocks the "Congdon" parted about one hundred feet from the bow and the remainder of the vessel dropped down at an angle, the stern of the ship being submerged in about one hundred and fifty feet.

Montreal.—The annual report of the Manchester Liners, Limited, of Manchester, England, has been received here. At the outbreak of the war the fleet consisted of fifteen steamers, and of this number eight were sunk by mine or submarine. Five steamers were purchased and two built to replace the losses, the year's work proving very satisfactory.



STOCKYARD LOOKING WEST

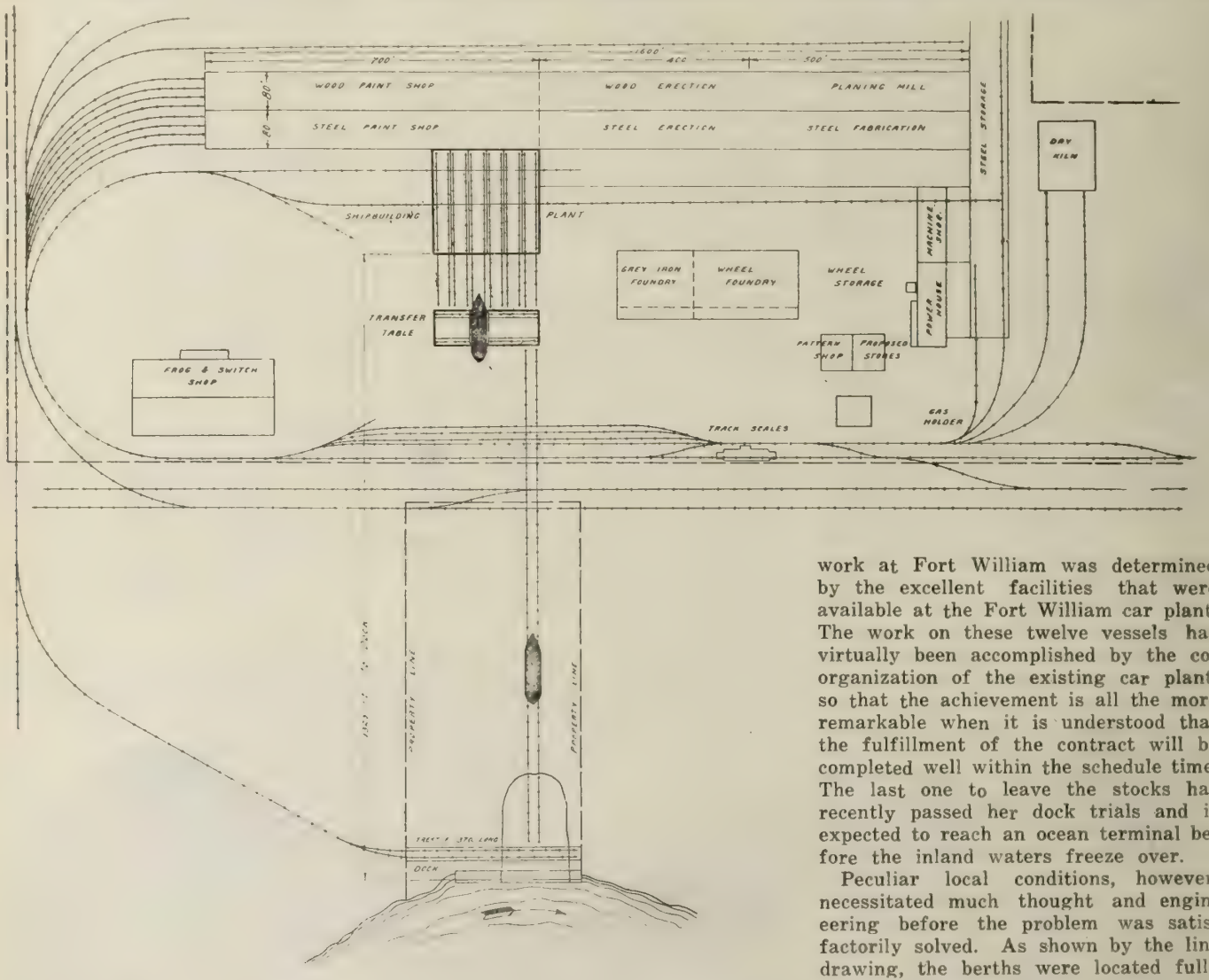
Building Mine Sweepers at Fort William

The Laying Out of the Yard Needed Much Thought and Planning to Get the Best Results—How Vessels Are Taken Down to the Launching Basin

SHIPBUILDING activity throughout the Dominion has been second only to the manufacture of munitions, and at the present time may well be considered on a par to that most important industry. In the immediate future and for some time after the cessation of hostilities the magnitude of shipbuilding will remain paramount among Canadian enterprises. When the building of vessels is mentioned, one generally thinks of what is being accomplished on the seaboard, or those rivers or waterways adjoining or flowing into the Atlantic or Pacific. Naturally, the bulk of the tonnage now under construction, particularly those vessels of large dimensions, are being built at the yards located close to the terminals where ocean vessels are accustomed to travel. This practice, however, is not followed, nor is it necessary, where the general dimensions of the boats will permit of their being taken through the canals that connect the Upper Lakes with the ocean waterways. Many of the vessels of 3,000 tons or less, that are now being built for the Imperial Munitions Board, the Canadian or the French Governments, have been constructed at different yards on the Great Lakes, and afterwards taken down to the St. Lawrence through the inland waterways.

Building berths are invariably erected in close proximity to the point of launching, to facilitate the operation when the boat is completed. This is a necessary essential when vessels are of large size, and it is even advisable for boats of any size, but for those of comparatively small dimensions it is not impossible to have the construction work performed at some distance from the launching point, providing facilities are adopted for removing the hull from the berth to the launching basin.

Early in the present year the Canadian Car and Foundry Co., Limited, felt that their Fort William plant could be utilized for ship building, and immediately started negotiations with the French Government, which negotiations consummated in an order for twelve mine sweepers, with the understanding that they would all be delivered at Fort William before the close of navigation this year. Considerable work was necessary in making preparations, but after careful consideration the Car Company decided to undertake the construction and delivery of these vessels by the time specified. The decision to do this work at Fort William was determined by the excellent facilities that were available at the Fort William car plant. The work on these twelve vessels has virtually been accomplished by the co-organization of the existing car plant, so that the achievement is all the more remarkable when it is understood that the fulfillment of the contract will be completed well within the schedule time. The last one to leave the stocks has recently passed her dock trials and is expected to reach an ocean terminal before the inland waters freeze over.



Peculiar local conditions, however, necessitated much thought and engineering before the problem was satisfactorily solved. As shown by the line drawing, the berths were located fully 1,400 feet from the nearest point of the river, where the launching would take place, and the difference in the two levels was approximately 50 feet. Owing to the current of the river it was deemed advisable to construct a launching basin at the foot of the incline. Part of the old dock was removed and a coffer dam constructed, and a basin excavated on the inner side

of sufficient depth and area for launching purposes. A channel with an 8 per cent. grade was made from the upper shipbuilding level to the launching basin. The double line of standard railway tracks that formed a runway for the launching cradles, were extended to the bottom of the basin.

It will be seen in the property plan that the upper end of the line of tracks, leading to the basin, coincide with the right hand berth of the shed, so that a vessel constructed in this end berth may be moved directly from its building position to the graded track. In the case of vessels in the other berths, however, it is necessary to transfer them from their respective berths to the line of launching tracks. On either side of each berth is located a line of standard gauge track that carry the launching cradles. These cradles are constructed of suitable timbers, built up to conform to the outline of the hull at the supporting point, and are supported by special trucks built for the purpose. Each couple is connected with two heavy cross timbers, and in addition the framework of the trucks are prevented from spreading by several heavy chains attached to eye bars on either side. Bow and stern cradles are kept at a maximum distance by an arrangement of cables from the framework of each truck.

When a vessel is ready for launching, the cradles are run into position on either side and the wedges inserted to transfer the vessel from its building supports to the cradle trucks. When this has been done the boat is hauled from the berth to its position on the transfer table, by means of locomotives operating on the company's tracks, at right angles to the center line of the vessel. The transfer table, upon which the vessel is located for side movement to the launching tracks, is in reality two separate tables, one supporting the bow cradle and the other the stern. This method was adopted owing to the distance between the two cradles.



MOLD LOFT, C. C. & F. CO.

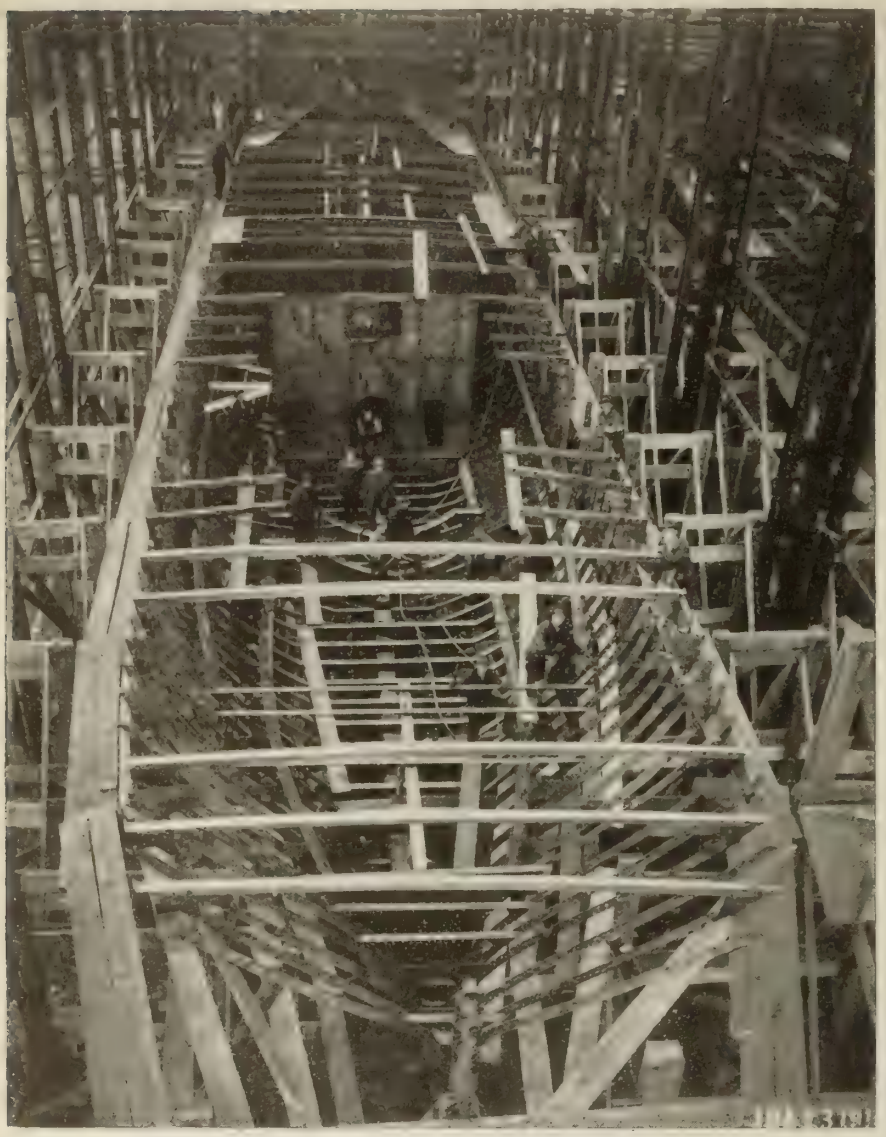
Intermediate tracks were laid to support the first or stern cradle in its passage to the transfer table. Short lengths of rails were used to connect the permanent tracks with those on the transfer table. The channels for the transfer tables were quite shallow, being about the depth of an ordinary car wheel; the trucks and tables were built up of structural steel. The tracks leading from the transfer table to the head of the incline, and likewise those in the cutting, are laid on long timbers resting on cross ties, which in turn are supported on short piles sunk in the earth. In one of the views is shown the Mantone, the first boat completed, ready to be slid down to the basin. When lowering the vessels down the grade the retarding cables are secured to locomotives and lines of loaded cars, to steady the movement down the incline.



MINE SWEEPERS UNDER CONSTRUCTION

The Mine Sweeper

The general characteristics of this type of mine sweeper are as follows: The overall length is 143 feet and the length between perpendiculars 135 feet, with a moulded breadth of 22½ feet. The displacement when loaded is 630 tons, and the approximate weight of the hull when loaded is 225 tons. After launching, the engines, boilers and necessary accessories (61 tons), water in the boilers, etc. (21½ tons) and general hull equipment (54 tons), are placed by the builders, and the balance of about 270 tons arranged for by the owners. These vessels are of the standard type of French trawlers, single deck with raised quarter and forecastle decks and steel deck house. The navigating bridge is located on the top of the boiler house and is provided with a steel house for the captain's quarters and accommodation for the wheelsman. The wireless room is located on top of the deck house aft, with lifeboat platforms on either side. Two pole masts are provided, the foremast stepped in a cast housing on the main deck and the mainmast supported by the deck house aft. All the vessels are fitted with six watertight compartments. The stern frame is made of one piece annealed cast steel, the rudder being of the double plate type built up frame. The steam steering gear engine is installed in the upper engine room.



BIRDS-EYE VIEW OF MINE SWEEPER

The main engines are of the triple expansion type and capable of developing 560 H.P., operating under a boiler pressure of 185 lbs., and a speed of 135 r.p.m., cylinders being 13x22x36x24 inches.

Boilers are of the "Scotch" marine type, 12 feet in diameter and 10 feet, 6 inches long. These boilers are fitted with interchangeable Morison corrugated furnaces 3 feet 6 inches in diameter, and operated on the Howden forced draft system. The vessels are electric lighted throughout, current being supplied by means of 7½ K.W., 110 volt, direct connected marine generator sets.

An efficient two-pipe heating system is installed, condensation draining to a trap, and thence discharged to a hot well. Pipe coil radiators are fitted in all quarters. Boats are equipped with eleven ventilating cowls, those leading to the boiler room being adjustable from the fire hold, so as to meet the varying conditions. These vessels are built to the full requirements of Lloyd's Register of shipping and in excess where specified, and will class as +100 A-I Steam Trawler.

GREAT LAKES DREDGING AND WRECKING CO.

The Great Lakes Dredging and Wrecking Co., Port Arthur, operate a fleet of dipper dredgers and tugboats around Lake Superior. The plant of the company is at Fort William and consists of machine shops for repair work, with an electric welding outfit, and a 1,000-ton floating dry dock. During the past year they turned their attention to building and laid down the ways, built and delivered two wooden steamers for the Imperial Munitions Board. However, the chief activities lie in the field of repair work, and the plant is really for the purpose of maintaining their own fleet in repair and such outside work as they may care to go in for. The plant is closed down all winter.

The Norton Grinding Company, Worcester, Mass., have issued a Universal Tool and Cutter Grinder book — fourth edition—in which they describe their Universal Tools and Cutter Grinder. The various sizes of this machine are shown and attachments are also illustrated for the handling of almost any class of work which may be desired. Types of work, and set-up for the machine, are given considerable prominence. The various shapes of wheels which may be used with these machines are very clearly shown by a number of line drawings.

The Greenfield Machine Company, Greenfield, Mass., has issued catalogue No. 6 dealing with their Universal Tool and Cutter Grinder. The catalogue deals almost exclusively with the various operations which may be performed on this machine. Each operation is illustrated with an engraving and directions are given as to the proper set-up required. The bevel and face mill holder attachment is shown by means of four operations which are done by its use, grinding an angular cutter, grinding the face of inserted tooth cutters, grinding the end of inserted tooth cutters, sharpening counterbores, and sharpening small end cutters. Another attachment which is shown enables butt mills having taper shanks to be readily sharpened. Other illustrations show the sharpening of spiral cutters, grinding formed cutters, grinding the flutes of taps, grinding the clearance on a reamer, and sharpening the end of a chucking reamer. Cylindrical grinding may readily be performed on the machine, and taper grinding with the same facility. The Universal Vise is one of the most valuable and important attachments furnished with this machine, and considerable information is given as to its use.

The Gisholt Machine Co., Madison, Wis., have issued a new catalogue on the Gisholt Standard Turret Lathe. In this catalogue a departure is made from the usual line of trade literature in that a considerable number of pages have been devoted to the illustrating of actual operations performed by the lathe. Close-up views of lathes at work are shown on the first thirteen pages of the catalogue, and it is stated that these photographs selected from a large number of different parts which have been finished on Gisholt machines show just what could be seen if a person stood beside the lathe doing the work. A number of operations shown are, machining gear blanks, machining cast steel wheels for trucks, machining steel gear blanks, and machining malleable iron wagon hubs. The machining of a cast iron truck wheel is taken through its various stages from the first operation to the production of the finished part. The use of the lathe in the machining of motor parts is shown in an illustration which gives a good view of the set-up used in the boring of steel cylinders for aeroplane engines. The mechanical advantages obtained by using the Gisholt Turret Lathe and the economical advantages obtained are gone into thoroughly and this information is followed by general specifications and dimensions together with pictures of the various sizes of the machines. The last part of the book is devoted to standard tools for the lathes, boring bars, reamers, tool holders, and chucks. The turret on the lathes, as well as the motor driven lathes, are illustrated and described.

THE GEORGIAN BAY SHIPBUILDING AND WRECKING CO. LONG ESTABLISHED

A WHOLE lot of useful work is performed round the Georgian Bay and other parts of the Great Lakes by the numerous handy little wooden tugs frequenting those waters. Many of these tugs have been turned out from the yard and wharves of the Georgian Bay Shipbuilding and Wrecking Co., and very many more of them come here when in need of skilful aid to effect major or minor repairs. The company has been operating under its present name for the last 10 years, but for twenty years before that the present manager, Mr. D. G. Dobson, conducted the business under his own name.

The yard is mostly occupied in building and repairing wooden craft, but some work is done on steel vessels also, mostly in the nature of removing propellers, or where work is confined to the after or forward end. A marine railway, 150 feet long is the means of carrying out this work, and a ship's nose or stern can be elevated on this slip in short order. It is the wooden variety that claims most of their attention, and the work is chiefly confined to that. Mr. Dobson, who is well and favorably known on the lakes, is a thorough wooden shipbuilder who has spent most of his life at this work. He designs and builds all the boats constructed in the yard, and has got around him a force of skilled ship carpenters, well qualified to handle anything that comes their way. The "Audrey C," of 75 horsepower, shown in the illustration, is a good type of the craft built here. It is somewhat a surprise to learn, that with the facilities on hand, and the long experience enjoyed in this class of work, this company were unsuccessful in their efforts to obtain the contract for some of the wooden ships built for the Imperial Munitions Board.

The yard presents a busy appearance, some six or seven boats being under repair on the wharves and slipway, and the cheery ring of the saw and adze are good music in the keen frosty air. This is the type of wooden vessel that will still be built when the large wooden steamer has been relegated to the limbo of forgotten things.



"AUDRY C.," BUILT BY GEORGIAN BAY SHIPBUILDING AND WRECKING CO.

WANT TO INVESTIGATE THE FORD CONTRACT FOR THE EAGLE BOATS

CONSIDERABLE interest attaches to the story that Henry Ford's contract for Eagle boats will be investigated. Senator Lodge calls for the investigation, and from the nature of the charges it would seem likely that Lodge's request will be allowed. Of course, there may be motives of purely political character behind the move. The Canadian Ford plant is in no way concerned with the rumpus that seems to be looming at Washington.

A despatch from Washington, referring to the matter, says:—

Senator Lodge introduced into the Record extracts from the series of articles now current in the "Daily Iron Trade," a publication devoted to iron and steel industries of the great lakes region, in which the deliberate charge was made that the Ford contract to build the Eagle boats was wasteful to the last degree, that the need for boats had long passed and that opportunity for profiteering to a hitherto unsuspected limit reposed in the exceedingly favorable contract which Mr. Ford holds with the Government.

The article which Senator Lodge used as the basis for his demand for the investigation was in part as follows:

"The cost of the Eagle boats originally was placed at $275,000, or $500 a ton without guns. The estimate cost now is $400,000, or $800 a ton. The cost of ordnance comes to $112,000 a boat. Under the contract agreement the Ford Motor Company is to be paid $20,000 over the actual cost if the cost of the hull and machinery exceeds $275,000. Twenty-five per cent. of any saving under $275,000 is to be paid the Ford Motor Company in addition to the $20,000.

"The contract reads, 'The contractors shall use every endeavor to deliver the first of said vessels within five months from the date of this contract, March 1, 1918, ten boats within one month thereafter, twenty boats within the next following month and twenty-five boats a month thereafter.'"

The article which Senator Lodge introduced into the Record draws the deadly parallel between this highly advantageous contract and the pacifist utterances of Henry Ford in which he said he would not accept a cent of profit out of his war contracts. The article continued:

"Had the late candidate for the Senate lived up to his contract ninety-three Eagles would have been completed and in commission by December 15. As a matter of fact exactly seven had been completed by that date, three being in New London, Conn., and four somewhere between Detroit and New London, and of these seven six were rushed to the coast leaking and generally incomplete to get them out before the freeze (of Lake Erie)."

The article declares that "the first Eagle leaked badly and not until she was electrically welded did she become water tight." The first Eagle was launched July 11, 1918, but could not start for the Atlantic coast until November 4.

The Plant of Collingwood Shipbuilding Co.

Complete Establishment Building Vessels and Equipping Them Throughout—Capable Men Are Behind This Organization—Can Handle Any Work That Can Pass the Great Lakes

THE first thing that one is aware of in stepping from the train in Collingwood, is the yard of the Collingwood Shipbuilding Co. This is fitting, as the shipyard is probably the leading feature of this thriving town.

The yard, which covers an area of some thirty acres, is a complete marine engineering plant, by which it is conveyed that the ships are built and fitted out in their entirety, engines and boilers being manufactured here, as well as hulls, and the engines and boilers are also built to the company's own designs. It includes, besides the machine and boiler shops, and the usual plate and angle working shops, two large dry docks, which are used as launching basins for the ships.

A spur line of the Grand Trunk Railway runs through the premises, and the foundry and machine shops are located on one side of this, the building berths and plate shops on the other.

The Dry Docks and Building Berths

The building berths are located at each side of the docks, there being four berths. These are served by travelling cranes running on trestles, the cranes being mounted on A frames. The trestles on the launching side can be dismantled when a ship is ready for launching in about 10 hours. These cranes can handle a weight of 15 tons, have a transverse span of about 65 feet, and can travel the full length of the berths. There is one ship of the Canadian Government's new programme on one berth, the construction having proceeded as far as the double bottom, one keel is laid on the berth adjoining, and on the other side of the docks the blocks are laid preparatory to laying a third keel. The "Canadian Warrior," the first of the ships, is lying at the shear legs, being in the completing stages.

The docks themselves are of large size. One of them will take a vessel of 525 feet in length, and the other, while not quite as long, is much wider, and is provided with blocks for taking two ships abreast. The pumping machinery is located in a power house adjoining the dock, and consists of one 36-inch centrifugal pump for emptying the docks, to which it can be connected through separate suctions, and two 8-in. drainage pumps. Both docks are occupied at present by lake freighters undergoing repairs. The plant is, therefore, pretty well occupied, having three berths and both docks in use.



GOVERNOR-GENERAL LAUNCHING TRAWLER

The Foundry and Machine Shop

The foundry is a lofty and well lighted building, with a ground space of 80 feet by 100 feet. A 35-ton travelling crane runs overhead to handle the castings, flasks, etc. The cupola has a charging capacity of six tons, and besides the iron



GENERAL VIEW COLLINGWOOD SHIPBUILDING CO.

cupola, there are two furnaces for brass and copper. These have a capacity of 500 lbs. Two large galleries are situated on the sides of the building, one of them containing the charging floor



TRAWLERS BUILDING AT COLLINGWOOD

for the cupola, the rest being used as a storage, and the other gallery is used at present as a storage for large patterns.

The machine shop adjoins the foundry, and is the same width and height, though longer. The floor is devoted to the heavy machine tools, and a central space, where the erecting is done. As in the foundry, galleries are provided, and one is devoted to fitting benches, while the other contains the tool room and stores. A large fan circulating air over coils heated by the fan engine; exhaust provides hot air for warming the shop and foundry. The shop is well provided with heavy machine tools for the necessary operations. A large open-sided planer for planing bedplates attracts the eye. An outrigger, consisting of an I beam base, on which are mounted heavy steel rollers, is provided for taking the end of the bedplate, which projects over the platen. By this means the bedplate can be all bolted up, and the journal beds planed in one operation. This ensures an absolute alignment. The planer is a Harvey Dettrick. A 72-in. American Tool Works faceplate lathe, to which a distance piece has been added under the head stock to bring it up to 96 in., is used for heavy work, and also for boring large cylinders. An 84-in. John Bertram & Sons vertical boring mill, and a 72-inch Universal radial drill are included in the heavier tools, with the usual engine lathes, shapers, etc.

Prominent in the centre of the shop was a set of engines for the Canadian Government steamers, and a very pleasing appearance they made. The cylinders are 18 in. x 30 in. x 50 in. diameter, and 36 in. stroke. They are of the open fronted type, that is the front columns are of turned steel, both the go-ahead and go-astern guides being carried on the back column. The reversing engine, of the straight ram type with balanced cylinder, is carried at the back of the engine on the H.P. column, the front of the engine being left absolutely clear. This feature, to one who has had any overhauling to do, is particularly pleasing. The air and bilge pumps are carried on the L.P. back column, and driven with the usual links and levers. The H.P. and I.P. valves, instead of being placed between the two cylinders in one casing, are separated, the H.P. piston valve being on the forward side of the H.P. cylinder, and the intermediate valve, also of the piston type, is placed between the H.P. and I.P. cylinder. This makes a neat arrangement, and eliminates a lot of clearance volume. A noticeable feature of the design is the ample bearing surfaces provided, the crosshead guide shoes having the appearance of being big enough for a much larger engine. The whole finish of the job is good, and commends itself to anyone who can appreciate the marine engine.

Condenser and Link Motion Shop

Adjoining the dry dock power house is a large and well lighted two-storey shop. This was used for a time as a shell shop, but is now devoted to condenser and link motion work. The condenser plates are drilled and tapped here, and the condensers built up. On the second storey a surprise awaited, for here the working force consisted entirely of girls. These young ladies had been employed on munition work, and made so good that when the shell work stopped they were given an opportunity to try other work. They were put on the small gear for link motions and condensers, mostly brass work, and are doing fine work, and are in a fair way to become a permanent institution. One wonders if they will ever be found on a ship's starting platform. If so, the writer may be tempted to sign on again.

Boiler Shop

On the floor of the boiler shop two 14x12 feet boilers, also for the Canadian Government ships, were in different stages of completion. These boilers are not built entirely in the shop, as the company have no facilities for flanging. The heads with the furnace openings are procured from outside firms, but otherwise the job is completed. To do this,



STEAMER IN COLLINGWOOD DRY DOCK



SS. "PAIPOONGE" AFTER CUTTING

the usual punching and shearing machines are installed, and a 12 foot plate rolling machine of the vertical type is in evidence. The drilling is all carried out by air drills, the multiple horizontal drill usually in evidence not being employed. There being no flanging done, there is no hydraulic outfit.

The Compressor Plant

The compressor plant is rather unusual. One looks in vain for the familiar horizontal compressor and motor. In its place is found a vertical compound, yet condensing marine engine, with the air cylinders mounted on top of the steam cylinders, tandemwise. This engine is practically a marine engine, though it is fitted with a flywheel. It was built and designed on the premises, and has a capacity of 2,500 cubic feet of air per minute.

In the same room are three induction motors direct connected to direct current generators, supplying direct current for variable speed motors on cranes, etc. There is also a condenser for correcting power factor, built by the Electric Machine Co., Minneapolis. It is 200 H.P., 60 cycle, 3 phase, 900 S.R.P.M., and controls the power factor within a remarkably low variation. Current is derived from the Hydro-Electric Commission.

The Punch Shop

The punch shop, located in close proximity to the building berths and plate storage, is a two-storey building, the mold loft, as is usual, being located on the upper floor, and extending the full length. The arrangement for handling material is somewhat out of the usual run, and, like most of the plant, is of home design. Instead of the usual electric crane, there are several trolley frames, running on roller bearings, lengthwise of the shop. On each of these is mounted a second trolley, also on rollers, capable of moving transversely across the main trolley. On this are hung chain blocks, and plates can be picked up and moved to any desired position by this rig in extremely quick and handy fashion. There are enough of them to serve all the machines, and the men do not have to wait for a crane, but hook up and move off anywhere necessary. The roller bearings make for easy and almost frictionless movement.

The machine tools are Long & Arlstat vertical shears and punches, a Hillis & Jones angle bending machine, wall drills, etc., in sufficient numbers to keep the work going through without delay. The stockyard is equipped with a Brown hoist, of three tons capacity, for handling plates to forge and punch shop.

Other Departments

The forge contains, in addition to the hand blacksmith fires, a steam hammer, and the plate and angle furnaces, with their accompanying slabs. The plate and angle furnaces are coal burning. Only light forgings are made in this shop, the eccentric rods, boat davits, etc. Shafting and connecting rods are obtained from outside.

There is a carpenter and joiners' shop for the necessary woodwork, such as berth fittings, etc. A pipe shop, containing 8 in. and 4 in. pipe threading and cutting machines, drill, lathes for pipe over 8 in. Adjoining the pipe shops is the air drill shop, where these tools are stored, and necessary repairs carried out.

The "Canadian Warrior"

A good ship deserves a good name, and the combination is well exemplified in this vessel. Of full canal size, 261 ft. x 43 ft. 6 in. x 23 ft. 6 in., well decked, with clear holds, and just four bulkheads, she has the utmost capacity of her size for cargo purposes. The accommodation provided for deck officers, engineers and crew are ample, the officers' and engineers' quarters on the bridge deck being especially well arranged. Going below to the engine room, the arrangement of the main and auxiliary machinery is very well thought out. The main engines, as already stated, are exceptionally clear and easy to get about. The side bunkers finish a few feet forward of the after engine room bulkhead, and in the recess thus formed, the auxiliary machinery is placed. On the starboard side, on the starting platform, is the fan and engine for Howden's forced draught, while on the stringer above, at the level of the middle grating, the electric lighting set is placed. At the after end of this, and projecting beyond it, is placed the engineers' storeroom, and this is a storeroom to delight the heart of a storekeeper or second engineer. An ample rack is built on the ship's side, while on the opposite side and along the forward bulkhead, a bench runs for cut-



FORWARD HALF READY TO SAIL

ting packing, and all the little jobs that are required in a storeroom. Lockers are fitted under this, and ample space to move around has been left. On the port side in the recess, and being on the bunker end and after bulkhead is the main condenser and auxiliary condenser. The ballast donkey and centrifugal pump are immediately under these, while the Weirs feed pumps and evaporator are placed on the bunker fore and aft bulkhead. Up above, on the top platform, are the feed heater and filter. The whole arrangement, while compact, leaves ample room for necessary overhauling, and for the engineer on watch to move around without being brained. One has



AFTER HALF READY TO SAIL

the feeling that these would be what are known as a "good job below."

The Company

The company was started quite a few years ago and is one of the oldest on the Lakes. It was formed under its present organization in 1917, the president being Mr. H. B. Smith, with Mr. J. W. Norcross and Mr. R. M. Woolvin as vice-presidents. The general manager is Mr. John S. Leitch, and the chief engineer, Mr. F. E. Courtice. Mr. Courtice has built and designed most of the plant as it now is, and is the designer of the engines already described. The yard of the Kingston Shipbuilding Co., at Kingston is now being operated by this company, under the name of the Collingwood Shipbuilding Co.

Mr. John S. Leitch

Mr. Leitch is a native of Scotland. He served his apprenticeship with the famous firm of Robert Napier & Sons, Govan, and in 1901 went to Swan Hunter & Wigham Richardson on the Tyne. He studied while there at the Walker Mechanics' Institute and the Rutherford College, Newcastle-on-Tyne, and later at South Kensington, London, where he passed with honors in Naval Architecture He was later with Workman & Clarke, Belfast, another well-known firm of shipbuilders, and came to Canada in 1912. He is still a young man, being born in 1880. He is a member of the Institution of Marine Engineers and Naval Architects of New York.

STANDARDIZATION

By A. L. Haas

In the opinion of many people in the business of mechanism, the solvent of all industrial troubles at whose magic touch production is to be increased manifold is termed standardization.

Interchangeability is well known and understood; it is, however, more adopted for the benefit of the producer than of the customer; although in the event of renewals it has sterling benefits to the latter. Mass production in quantity of a single article or detail is also understood. Recent events have shown how this can increase output and by division of labor increase production. Combination of the smaller firms into large associations and the distribution of manufacture according to capacity is also advocated and must have advantages by confining the efforts of a single firm to a specialized end and so cheaper production. The efforts put in practice hitherto toward standardization were inaugurated by the Engineering Standards Committees, who agreed on standard details of various kinds. It was never pretended that the standards set up by the E.S.C. were otherwise than a means of existing practice and fixed as a compromise. It was never contended that the standards thus fixed were basic or ideal. In the interests of the community as a whole, at a time when the need for production is most acute, the existing standard details should be more operative than at any normal time. Even, however, when the need for such standards is most acute, anyone vested with authority demanding special flanges and bastard threads has no difficulty in obtaining supply. Government departments demand and obtain articles of standardized type (where a firm has had the good sense to reduce the diversity of product), but insist upon special flanges, not to B.S. drilling, and so cause confusion and possible mistake at the present time of high pressure.

The infraction of standards in the case of flanges and threads is difficult to understand; they were two essential details which simplified production and lessened shop mistakes and yet specials persist to cause trouble.

Standardization will only be real when nothing but standard material in the shape of non-essential detail can be procured except with superhuman difficulty.

To standardize detail is one thing, to standardize product is another. Most firms endeavor to reduce diversity in the interests of their own production; the newspaper advocates of the idea seem to imagine that standardization is a word which works miracles and its virtues are universal.

There are certain latent dangers obvious to any reflective intelligence if the doctrine is pushed too hard. It may ensure uniformity at the expense of real economy, and its tendency is to stop mechanical evolution. As an example, railway practice is conservative in its evolution due to the standardization necessary and the expense of even detail alteration, which must be wide spread if installed. It is, of course, easy to change for the sake of change, and standardization acts as a brake upon freak design and too vivid imagination. What it is desired to point out is that individual concerns considered, standardization in very fair measure is already practised and the critics overlook the facts. There is nothing in mechanism fixed externally, either new material, improved economy, increased output, special circumstances or invention cause change. To hamper rational evolution by wholesale standardization by insisting that similar firms produce identical goods is, on the face of it, folly. Makers may agree to split trade and thus sectionalize and specialize but to carry the process to the lengths of some advocates will penalize industry and eventually the consumer at large.

There would be little lost, for instance, in the deletion of the odd sizes in the wire gauge. In the shape of material they are rarely called for save for special purposes. The odd or intermediate sizes of wrought iron tube are in the same category, as also are bolts and nuts. In the case of cast iron pipe the trouble to get specials led to at least one foundry specializing in specials with quick delivery and refusing orders for straight pipe. This is in accordance with common sense, a firm set apart for a single although varied product. The trouble the average machine tool firm has to get the smaller details from the foundry leads to the reflection that it would be of value if the practice were extended in other quarters.

Polson Iron Works Established Over Thirty Years

Shipyard Presents Busy Scene—Four Vessels on Stocks—One Completed and Ready For Sea—Another One in Fitting-out Basin —Machine Shops and Boiler Shops in Full Swing

NOT all the shipbuilding yards of the Great Lakes have been brought into existence by the abnormal demands of the great war. The institution that is the subject of this article has been in active service since the year 1888 under the same name, the Polson Iron Works. During this long life they have built a great variety of vessels, ranging from the famous roller boat, which lies in the bay close to the yard, and the railway car ferry illustrated here, to the 3,500 ton steamers for the Imperial Munitions Board and other interests that have been built during the last twelve months, and which are at present being built.

The Shipbuilding Yard

The yard contains four berths for building, each of them long enough to build the full canal size steamer. They are arranged on each side of the plate shop, two in line. Each berth has a large gantry crane running the full length of the berth, electrically operated. There is a ship on each berth at present, and one is in the fitting-out basin, almost completed, while a second ship is all ready for sea, and only just missed getting away before the close of navigation. The company built and delivered last year the "War Taurus," "Asp," "War Hydra," and "Tento." Besides the four vessels on the stocks at present, the company have contracts for six others, so that they will be busily occupied for some time to come.

The Boiler Shop

The Polson Iron Works build all the boilers for the ships they construct, and in order to carry this work on, they have a large and well equipped-boiler making department. In this shop can be seen the Scotch marine boiler in every stage of its construction. A number of corrugated furnaces stand in one end of the shop, waiting to be fitted in their respective boilers, while in another part are the uptake breechings with their accompanying perforated plates for the Howden forced draught system. Combustion chambers all riveted up ready for fitting in the shells, end plates being flanged in the 150-ton hydraulic flanger, and a large plate bending roll are in evidence.

Occupying a conspicuous place in the floor space is a boiler almost completed, with workmen busily engaged in drilling the shell plates for the rivets with air-operated drills. Further on is a boiler shell in the initial stages of erection. Hydraulic pressure is supplied for the flanging machine and bull riveter by a three throw Deane pump, belt driven, delivering to an accumulator at 1,000 lbs. per square inch. A Canadian Ingersoll-Rand two-stage air compressor supplies air for the air tools used in this shop. The usual complement of wall drills, shears and punches is installed.

The Erecting and Machine Shop

The erecting and machine shop are large and well lighted, and are fully equipped for the work in hand. As in the boiler shop, work can be seen here in every stage of progression. A set of triple expansion engines, completely erected, occupy the centre of the shop, with another set about half erected right opposite them. One sees a large low pressure cylinder being bored on a one hundred and twenty inch vertical boring machine, while the bedplate for the same set of engines is being planed on a huge planing machine. Connecting rods, crank shafts, eccentric rods in the rough, half finished and finished stages are being turned in the various lathes, of which there are an ample number. A notable feature of the erecting shop is a vertical gas heating arrangement, for facilitating the fitting of the brass liners on the tail end shafts. This apparatus has been developed by Mr. Wall, the works manager, after careful experiments, and has proved a time saver as well as a labor saver. It consists of a number of perforated pipes arranged to form a circle of about 24 inches diameter. The perforations open to the inside of the circle, and when gas is supplied to the apparatus, for a number of equal sized burners. The liner is placed in the annular space between the burners, and a readily controlled amount of heat is delivered equally all over the surface, expanding it sufficiently for the shaft to slide in the full length. This method allows the liners to be fitted in one piece, and not only that, but makes it possible to easily remove them if necessary, instead of having to cut them off, as was the old practice.

The Punch and Plate Shop

The punch and plate shop is located in between the two sets of building berths, and right in line with the plate storage. The large machines are of the direct steam driven type, that is rather



CAR FERRY "ONTARIO," NO. 2. BUILT BY POLSON IRON WORKS, TORONTO.

unusual to see in these days of motor drives. The plate and angle furnaces are located in the same shop as the punches, and the large plate rolls are also in this shop. The heavy plate machines are arranged down the centre aisle, and consist of the usual double ended punch and shearing machines, horizontal angle punch, etc. The lighter machines are located on the sides, such as wall drills, small angle shears.



WAR TAURUS BEFORE LAUNCHING.

The forge is located at the shore end of the yard, and contains two steam hammers, and ten hand fires; also a small bending slab. Most of the forging for ships and engines is performed in this shop. At the end of the forge is a steam boiler plant, supplying steam for heating and driving the air compressor, which supplies the air for all the air tools in the yard.

Haste Not Everything

Discussing the shipbuilding situation with Mr. Frank E. Wall, the works manager and chief engineer of the Polson Company, the subject of making records in shipbuilding was brought up. Mr. Wall pointed out that building and completing a vessel in the shortest possible number of days was not so desirable an accomplishment as the general public might be led to believe. He pointed out that many of these ships, after a short trial trip, had to be re-docked and considerable time spent on them, before they could undertake a long voyage, but this phase was never referred to in the published reports of the records achieved. He held it was more desirable to take a reasonable length of time for the building and completion of the ship, so that when she was completed she was ready to start on a voyage of any duration without the necessity of dry docking.



FRANK E. WALL

Mr. Wall was born in London, England, in 1884, but came to the United States with his parents when only one year old. His development has been, therefore, under American manners and ideals. After serving an apprenticeship in the engineering trade, Mr. Wall went through a course of study under a private tutor in naval architecture.

His first important position was in the United States Navy yard in Norfolk, Va., in 1905, and from there he went to various responsible posts, one of them being on the engineering staff of the Public Utilities Commission of New York City.

In 1915 he went to Mobile, Alabama, to supervise the building of the shipyard there, and so successful was he here that the United States Government called for his services in 1917 as a supervisor of steel ship construction, which position he filled until coming to the Polson Iron Works in the spring of 1918.

LATHE WORK—BORING

By J. J. DIXON.

In machine shops where a great variety of work is done it is almost impossible to keep the operation of boring to special machines and, therefore, nearly all lathes have to perform a certain amount of this work—usually by the use of the twist drill being held in the spindle of the tailstock. This method is, generally speaking, successful in the case of boring from solid metal, but where cored holes have been put in the castings it often gives trouble to the operator, and is the ruin of more twist drills than all the drill presses in the shop. The following are some of the causes of the trouble and the remedy for same. First, in too many cases the core holes have been made too large not leaving sufficient metal for finishing up to size. Cored holes should at least be ⅜ of an inch smaller than finished size of bore. This allows the drill to cut metal instead of sand, as is often the case; the best twist drill made for cutting metal will not cut molders' sand for long. Another point is that the operator often uses the drills ground in the same way as if boring from the solid metal; this is not a good practice and is also detrimental to the drill. The drill for cored holes should be ground with the same cutting clearance, but almost straight on the face instead of the usual long angle or pointed drill. As a pointed drill will follow the core hole the drill should be ground more like a flat bottoming drill, and a hole that is started true in this manner will keep true much better than when using a long angle on the drill, as it is more in contact with the metal to be removed, and has not the same tendency to follow the core hole, say with a job 8 or 10 inches long in the bore. The core hole is often more out of truth the further you get towards the back of the casting. With 3-16 or a ¼ of an inch a side of metal to work on the drill started true will bore a true hole, or true enough for a light cut by finishing tool. Another fault in using twist drills on the lathe is that in most cases no provision is made in the tailstock spindle for preventing the drills from turning except the pressure on the taper fit. A slot should be cut in the spindle to take the flat on the end of the drill exactly similar to the drill press spindle. This would save a lot of trouble, also the wear of tailstock spindle which occurs when drills turn on account of not having a slot cut to receive the flat, which is shaped on all twist drills with taper shanks. Three out of every four lathe tailstock spindles are spoiled, where twist drills are used; by not making the above provision. It also provides an easier method of removing the drill by being able to use a drift, and is a decided advantage when using a floating reamer, as the socket which holds the reamer, unless provided with flats shaped on the end and a slot to receive it in the spindle gives the same trouble by turning, as the twist drill, causing a bad fit for the centres, and will soon throw one centre out of line with headstock centre. It will also be found a great saving in using small drill chucks having the same above advantage. There have been a good many accidents to operators by the method of putting a lathe dog on the drill to prevent it turning in the sleeve or spindle. Sometimes, the dog not having been brought down to the rest, a little extra pressure on the drill results in the drill turning, bringing down the dog with the operator's fingers underneath, which means a case of compensation through not adopting a simple, practical, safety first device.

Dominion Shipbuilding Company has Large Plant

Four Ships Delivered in 1918—Five Vessels Now on the Stocks —One at the Fitting-out Basin—"St. Mihiel" Loading For China

RISING from the ashes of the old Thor Iron Works at the foot of Bathurst Street, Toronto, the Dominion Shipbuilding Co. came into existence in the year 1917. It is located on land reclaimed from the waters of Toronto Harbor under the Harbor Commissioners' reclamation scheme, and was built as fast as the reclaimed land was available for foundations. The plant today covers a space of fifteen and a half acres, and is fully occupied in turning out ocean-going freighters of the regular canal size, that is, 3,500 tons deadweight capacity.

During 1918 the company not only built the plant, but built and delivered four steamers, and a fifth vessel has just been launched. This steamer has the honor of bearing the name of "General Currie," after the famous commander of the Canadian Army Corps, and the five vessels to follow are to be named after other famous Canadians. There are at present on the stocks five vessels in varying stages of construction, the keel of one having just been laid in the berth vacated by the launching of the "General Currie." The "St. Mihiel," launched in October last, is at the time of publication loading a general cargo in New York for Shanghai and China coast ports.



LOUIS DAHLGREN

The "General Currie" is a steel cargo steamer of the following dimensions. Length over all, 26 feet. Breadth moulded, 43 feet 6 inches, and depth moulded, 28 feet 2 inches. She is subdivided by five bulkheads, four of which are watertight, and one non-watertight, and has a deadweight capacity of 3,550 tons. Built to Lloyd's classification 100A1. The propelling equipment consists of a set of inverted reciprocating triple expansion engines, with cylinders of the following dimensions: H.P. 20 inch diameter, I.P. 33½ inches and L.P. 55 inches, the stroke being 40 inches. Steam is supplied by two Scotch marine boilers, 14 feet 6 inches diameter by 12 feet long, built by John Inglis Co. The indicated horsepower is estimated at 1,400, with a working steam pressure of 180 lbs. per square inch. The vessel will carry the 3,550 tons deadweight at an average speed of 10 knots on a consumption of 22½ tons of coal per twenty-four hours. For cargo handling purposes she is equipped with six reversible single drum steam wrenches, working at four hatchways. There is also a steam windlass on the foc'sle lead for raising anchor and warping purposes. The winches, windlass and steam steering gear are made by the Bawden Machine Co., Toronto, the winches being the 7 in. x 7 in. x 12 in. size.

The Buildings and Building Berths

There are at present erected and in operation, the main building, containing angle and plate furnaces, the bending slabs, angle iron smith's shop, and the punch shop. The machinery in these shops is sufficient to allow of handling about 75 to 100 tons steel in a working day of nine hours, all on the ground floor.

The power house containing two Sullivan air compressors is in this building on the ground floor, also the warehouse and stock room, the joiners' and carpenters' shop, and the mold loft. On the second floor the rooms are all large and well lighted. and some idea of the size can be got when it is said the building is 485 feet long by 210 feet wide in the way of punch shop, and 110 feet in way of power house, etc. The building is of steel frame construction with concrete walls reinforced, and the roofing is of corrugated iron over the punch shop, the mold loft being covered with a built-up roof.



THE SHEER LEGS.

The plate and angle furnaces are of the oil burning type and are capable of handling the longest frames and plates required, made and installed by Toronto Incinerator Co.

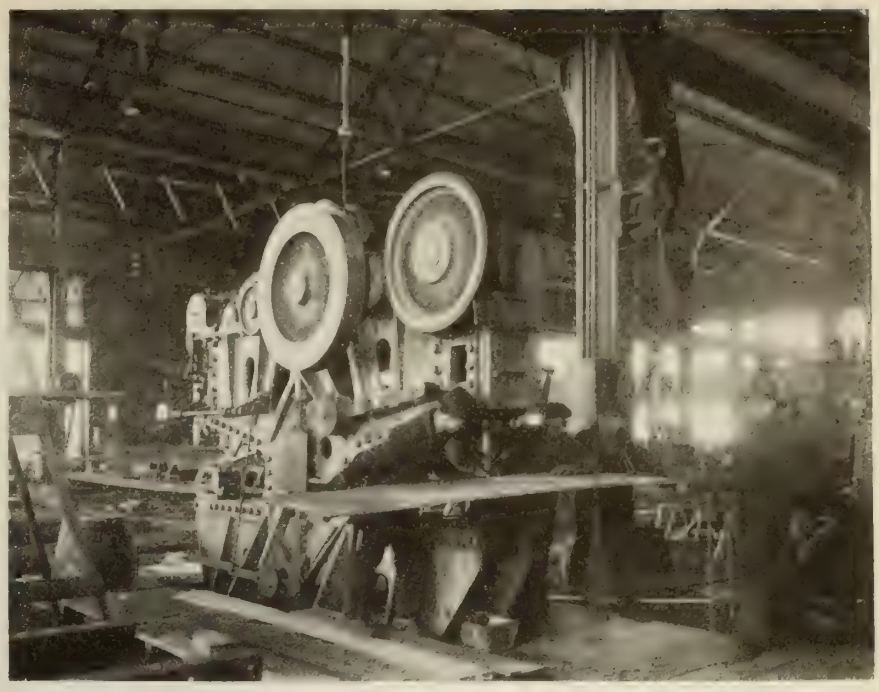
Foundations are in and steel framing erected for a second building, which will contain an electrical shop, pipe shop, machine shop and forge, and pattern shop. This building, when completed, will be 425 feet long by 110 feet wide, of the same construction as the punch shop As soon as this building is completed, or sooner if conditions permit, two other buildings containing foundry and boiler shops respectively will be erected.

The machinery already installed for handling steel at the ship's side consists of three gantry cranes, and for installing engines and boilers a 100-ton shear legs is installed. The steel necessary for the construction of these vessels is all either in the yard or on the way. There will therefore be no delay in the construction through waiting on material. Contracts have been placed for the engines and boilers of five ships and three trawlers. The capacity of the yard when completed will be about 12 ships per year of full canal size, that is, 261 feet long by 43 feet 6 inches beam, and about 3,500 tons deadweight. To ensure this capacity the layout of the yard has been planned so as to eliminate all unnecessary handling of material, enabling each department to go ahead with its

particular part without being delayed by the preceding one.

Mr. Dahlgren, the general manager, has been connected with the shipbuilding business since 1893, his early years being spent with the Superior Shipbuilding Co., Superior, Wis. He was with this company in various capacities from 1893 to 1900, and from 1902 to 1912. The intervening two years were spent with the Union Works, San Francisco. Coming to Canada in 1912, he was first assistant superintendent, becoming later superintendent and then general superintendent of the Western Dry Dock and Shipbuilding Co., Port Arthur, remaining with them till 1916. He then came to the Thor Iron Works, Toronto, as superintendent, and in 1917 was appointed manager of this company. On the formation of the Dominion Shipbuilding Co. in August, 1917, he was appointed general manager, and for a time, while the transition of the two companies was taking place he held both positions.

The Dominion Shipbuilding Co., with the up-to-date equipment installed should occupy a prominent place in the development of Canada's shipbuilding development.



LYSHOLM PLATE PUNCH.

Steamer Morden Makes Record.—The big Canadian steamer, W. Grant Morden, of which Capt. Geo. Pearson of Owen Sound is master, has made a record showing for the season, and her freight earnings for the last round trip will be the largest ever made by a lake freighter. The steamer left Buffalo early in the month for Duluth with a cargo of hard coal, and was due back at Buffalo on Monday or Tuesday with a load of grain. The Morden took about 13,000 tons of coal on the upbound trip, at $1.15 a ton, and on the run down she has 450,000 bushels of wheat, for which she will receive 7c a bushel. The freight on the latter cargo is, therefore, about $31,500, and figuring on the coal at $13,000, she will earn about $44,500 on the round trip. The Grant Morden holds the record for the largest tonnage to go through the Soo Canal.

Washington—The estimated cost of the great shipbuilding plant at Hog Island was estimated recently by Charles Piez, the president of the Emergency Fleet Corporation, to be in the neighborhood of $63,000,000. The yard, he said, has delivered one ship and has laid the keels of fifty more. The approximate cost of the ships being built would be, according to Mr. Piez, in the vicinity of $225 per ton. This is considerably higher than the prices ruling in other countries.



GENERAL PLAN OF DOMINION SHIPBUILDING CO.

The British American Shipbuilding Company

On the Banks of the Welland Canal—Yard is Not Yet Completed —Ships Being Built While Plant is Being Arranged

Many of the Canadian yards have been more or less handicapped in their efforts to get started. In some cases it has been the difficulty in obtaining material, in others, of obtaining help, sometimes both combined. However, whatever the difficulties, they have been surmounted, and the ships supplied in what is really good time.

The British-American Shipbuilding Co., located on the banks of the Welland Canal in the town of Welland, show quite a notable example of this perseverance against odds. They started operations in July last, not building ships, but building the yard to build the ships in, and succeeded in having one ship practically ready for sea by the close of navigation. This vessel, the "War Weasel," could have gone across as she was, but the declaration of the armistice relieved the immediate necessity, and she was kept on this side for the finishing touches to be put to her.

The Yard

The yard presents an interesting spectacle at the present time. At the fitting out basin lies one hull, just launched. Ahead of this one lies the "War Weasel," getting her final fitting out, while on the stocks is the keel of a third vessel, just laid. Above the wharf great activity prevails, the new punch shops and plate shops being in course of construction, while the old shops are still carrying on to some extent. At the head of the new plate shop lie the three rolls for the new plate roll, large enough to handle the biggest plates. At the lower end of the new shop the modern oil-burning plate and angle furnaces are being installed. The new joiners' and carpenters' shop has been built, and adjoining this is the mold loft, large enough to lay out the 4,300-ton size of vessel.



PARTIAL VIEW OF FITTING OUT CRANE.

When the three ships at present under way for the Imperial Munitions Board are finished, work will be commenced on two ships of the 4,300 deadweight size. These are some 800 tons larger than the ships now being built, and will have to be cut to allow them to go through the locks of the canal. They will be cut probably just abaft the fo'c's'le head, this being sufficient length to make the locks available.

The yard is comparatively narrow, and has only about 600 feet available as berth space. There is no chance of extension lengthways, and therefore two ships of canal size at one time will be all that can be laid down. The berth is served by a locomotive crane of the whirling derrick type, travelling on tracks through the storage yard, and the full length of the berths.

At the fitting out basin a crane, of the whirling design, and capable of handling weights up to 72 tons, is installed for putting engines and boilers in the ships. This crane was designed and built on the premises. A partial view of this crane can be seen in the illustration.



GENERAL VIEW OF YARD.

The "War Weasel"

The "War Weasel," the vessel completed and ready for sea, is a good type of the modern cargo vessel built during the war.

Some of the fittings installed in her have now become unnecessary on account of the cessation of hostilities. For instance, she was built to carry guns fore and aft for defensive purposes, and those guns of course are no longer needed.

However, some structural details were involved that cannot very well be removed. For instance, in the poop, where the firemen's and sailors' quarters are located, considerable space is taken up by the ammunition magazine, which is of steel plate and angle construction. This may be removed later, but the extra stiffening built into the ship for gun supports could not be removed without considerable expense.

The cargo derricks have all been arranged with the idea of making the vessel inconspicuous at sea. The derrick masts are arranged to swing on their supporting pins and fold down to the deck below the bulwarks. The single mast for carrying the wireless, signal flags, etc., has a telescopic topmast. The funnel is short and straight, and when the ship is loaded and camouflaged in the approved style, she would certainly be difficult to pick up from any distance.

The vessel is fitted with Westinghouse turbines, compound, with reduction gear between rotors and shafts. The dynamo and evaporator are fitted in the recess on starboard side of engine room, and the forced draught system of the Howden type is placed in the forward bend of engine room on starboard side. On the port side the winch condenser, feed pumps, ballast, donkey, etc., are located. The turbine arrangement, with its small demand of space, leaves a very clear and open looking engine room arrangement.

The boilers are of the Scotch marine type, 14 feet 6 inches diameter, and two in number. A notable feature of these new steamers is the extra attention given to the accommodation of the sailors and firemen. Instead of the fo'c's'le under the fo'c's'le head, in the eyes of the ship, the men are housed in the poop. They have rooms containing three men in each, and instead of the old style wooden bunks, each man is provided with an iron framed cot and spring mattress. The after-end of the ship is much more suitable for comfortable accommodation than the fore-end, and there is much less difficulty in getting to and from the quarters in bad weather.

Officers and engineers are housed on the bridge deck on each side of the engine room casing. The rooms are large and airy, and well fitted for the comfort of the occupants. The captain is accommodated on the bridge, and in the saloon. The stewards' pantry, etc., are off the main saloon.



STOCKYARD.

WOMEN NAVAL ARCHITECTS

The entrance of women into many scientific activities has shown itself from time to time in an earnest desire to be given a status in the particular activity in which they have qualified themselves to become useful members. It is certainly a sign of the times when the Council of the Institution of Naval Architects is seeking to obtain the views of the various classes of members of the Institution on the subject of the admission of women to such class or classes of membership as they may, apart from the question of sex, be qualified for under the present rules of the institution. At the present time, women are not eligible under the existing rules covering the admission of candidates, and it is therefore necessary to alter such rules, which requires the assent of a two-thirds majority, and if this is obtained, the consent of the privy council to the corresponding alteration in the Royal Charter of Incorporation would have to be also obtained. It is understood that at the present moment there are only three ladies seeking admission into the institution, each of whom has received a technical training, and has been engaged in making calculations or carrying out experimental work connected with shipbuilding. One of these ladies is the joint author with a member of the institution, of a paper contributed to the present year's transactions, viz., "The effect of the longitudinal motion of a ship on its statical transverse stability," by Mr. G. S. Baker, O.B.E., and Miss E. M. Keary, and was read recently. If women are admitted they will only be admitted on the same qualifications which apply to the opposite sex.

SALARIED MEN

The tendency of modern business is to favor payment by results, for there are few branches of work in which such payment, where it can be applied, does not yield increased output and earnings. Even before the war some industries could not prosper without it, and after the war, few will be able to survive that do not adopt it. Methods of payment by results are naturally easiest to devise for men engaged on direct production, whose individual work can be directly measured. They are less easy to arrange, though not impossible or unusual, for the much smaller class of men who have the entire control of some separate manufacture. But between these two extremes there are large numbers of men whose work, though it is indispensable to production, cannot be identified or measured separately. They include some of the most valuable workers, whose skill may often require an education as well as ability much beyond that of those who are paid by results. For the efficiency of an industry to be maintained, or advanced, the right men must be attracted into this class of work, and, in order that they may be, their reward must be made attractive. There is too much reason to believe that salaried men as a class are paid less than they would get if the actual value of their work could be measured, particularly those in posts that receive the medium or lower salaries. The draughtsman, the works engineer, the works chemist are usually keen on their work and do their best; but this is not sufficient if the best men are not attracted, nor can underpaid men of ability, however good their intentions, do as well when engaged on work that is not paying them fairly, as they could with the encouragement and stimulus of proper remuneration. The standards of salaries paid for this class of work will determine the class of lads who will look to it for their careers; and the engineering trades might well consider whether these standards are as attractive as would be reasonably prudent.—M. E.

Washington.—Ships carrying 200,000 tons of food for the populations of France, Belgium and Austria are now en route to Europe, proceeding under sealed orders to Gibraltar and Bristol Channel ports. They were sent on Mr. Hoover's orders.

NATIONAL SHIPBUILDING COMPANY, GODERICH, ONT.

The plant of the National Shipbuilding Co. at Goderich is at present engaged solely on the work of building marine engines and boilers. A shipbuilding yard is under consideration, and a site for this purpose has been chosen, and it is probable that shipbuilding may be undertaken in the near future.

The company is at present busily engaged extending the plant for the boiler and engine construction, and are turning out the engines and boilers at the same time. Their shop was originally located on the premises of the Doty Engine Works, an old established manufacturing concern of Goderich. The space and machinery not being adequate for the requirements of the new concern, a site was secured closely adjoining the Grand Trunk Railway tracks, on which has been erected a fine machine shop, and the boiler shop is at present under construction. The buildings are both of steel frame with wood sheathings, this being the material most available, and involving no delay.

The Machine Shop

The new machine shop is a spacious building 120 ft. long by 80 ft. wide. It is equipped with two overhead travelling cranes, one of 15 tons capacity, electrically operated, and one of 5 ton capacity, hand operated. The shop is well equipped with the necessary tools for turning out marine engines, and a good space is available in the centre aisle of the shop, in which to do the necessary erecting and testing of the finished engines.

Among the characteristic machine tools found in this shop is the large shaft lathe, 21 ft. 6 ins. between centres, and swinging 62 ins., made by the London Machine Co. Other tools by the same makers are a 28 in. by 15 ft. lathe, a 6 ft. radial drill, one 6 ft. by 6 ft. planer, and one 4 ft. by 4 ft. planer. A large gap lathe, swinging 72 in., with extension bed, made by McGregor, Gourlay Machinery Co., several speed lathes, screwing machines, etc., complete the equipment.

The Boiler Shop

The boiler shop will be, when completed, an up-to-date department in every respect. The hydraulic equipment is being installed by W. H. Wood, Philadelphia, and will be adequate for the purposes for which it is installed.

It consists of a duplex steam pump, hydraulic accumulator, 150-ton hydraulic flanger, and hydraulic riveter. The shop will be served by two 10-ton capacity electric cranes. There are on the ground at present a radial drill, plate edge planer, vertical plate rolls, and an oil-burning annealing furnace. It is expected to have the remaining machinery installed, and the shop in operation before the end of February.

Work in Hand and Completed

The company, since starting in operation in the latter part of 1917, has completed considerable work.

For the Dominion Naval Service Department, seven boilers of the Scotch marine type, 10 feet 6 inches diameter, were completed. Three boilers of the same type, but of 13 ft. 6 ins. diameter, for the Dominion Shipbuilding Co., Toronto, were completed, and eight boilers of 14 feet 6 inches, for the Emergency Fleet Corporation of the United States, were also delivered.

There are at present under way, eight sets of twin-screw compound engines for the steamers being built in Montreal for the French Government. These have cylinder dimensions of 12 inches high pressure, 24 inches low pressure, by 16 inches stroke.

For the Dominion Shipbuilding Co., of Toronto, the company are building three sets of triple-expansion engines, with cylinders of 12¾ ins. x 21½ ins. x 35 ins., by 24 ins. stroke.

There are five sets of engines for the Emergency Fleet Corporation of the United States, and there is a possibility of this number being increased by eight. These are of the compound type, with cylinders of 18 ins. x 36 ins., 26 ins. stroke.

The company has thus enough work in sight to keep them busy for the whole of this year at least. While there is no definite knowledge of the proposed shipbuilding plant, it is a strong probability. This combined with the engine and boiler building shops should prove a great asset to the town of Goderich, and be a welcome addition to the marine engineering industry of the Great Lakes.

CANADIAN ALLIS-CHALMERS, LTD., BRIDGEBURG, ONT.

The shipbuilding industries of the Great Lakes are spread around their shores from the extreme west to the most southerly and easterly confines. Those situated in the Niagara Peninsula district enjoy probably the most favored situation, both climatically and in their near proximity to the sources of raw material.

Situated on the shores of the Niagara River, about four miles from Bridgeburg, the plant of the Canadian Allis Chalmers Co. is splendidly located. It is reached by the Grand Trunk Railway and the Michigan Central Railway. Its boundaries enclose a square mile of land, the river frontage being 1,800 feet. The land is practically level, there being only a slight drop to the water front.

The company has contracts for six canal-sized vessels, 261 feet by 43 feet 6 inches by 23 feet 6 inches. Of these, one is almost ready for launching, the launching ways having been placed, while a second one is on the stocks with the double bottom laid.

On the other side of the yard two more berths are in course of construction, the blocks having been laid for two more keels, and work is actively proceeding on dredging out the basin. There is space available for four more berths if found necessary at some future date.

The Gantry Crane

The two berths now in use are served by a gantry crane of fifteen tons' capacity, electrically operated and mounted on A frames, the frames running on trestles that extend the full length of the berths. An interesting feature of the arrangement is that the outside trestle, the one on the launching side, is mounted on rails so that when the vessel is ready to launch, the trestle can be drawn back clear of the ways. This obviates the necessity of pulling down the trestle work which has usually to be done with this type of berth crane previous to a launch.

The Shops

The shops are situated at the head of the berths, between them and the stockyards. The punch shop, forge, plate and angle furnaces are all under one roof. The shearing and punching machines are situated down the centre aisle of the building. On the right hand side, looking towards the berths, is arranged the forge, and plate and angle furnaces. These latter are of the oil-burning type and have their accompanying forming slabs in the usual position. On the left hand side of the shop are situated the large plate rolls, wall drills, etc. The shop is served with an overhead electric crane.

Stock Yard

Immediately behind the punch shop is the stock yard, and there is ample space here to store plates for a dozen ships if they could be obtained in such quantities. The Michigan Central R. R. is reached by a private track leading into the yards and an overhead crane travels over the yard to handle the plates and shapes for the shops.

Power House

The power house, situated in a separate building some distance from the plate shop, contains the motors and generators necessary for the work of the shops. Power comes from Niagara at 22,000 volts, to a separate transformer house, from which it is conveyed to General Electric induction motors, which in turn drive General Electric direct-current generators, which supply the power for the variable speed motors in different parts of the plant.

For supplying air to the hammers, drills, etc., a compound Ingersoll air compressor, with a capacity of 1,300 cub. feet free air per minute is installed.

Joiners' Shop

The joiners' and carpenters' shops are located in a large, well-lighted building situated at the head of the new building

berths. Here is carried on all the work of fitting out the officers' and crew's accommodation. It is equipped with the usual complement of woodworking machinery. Adjoining is the paint shop, while the stores and warehouse are situated close by. The same building houses the general offices.

THE DEVELOPMENT OF INDUSTRY BY SCIENCE

THE following interesting and illuminating summary of the work of the Canadian Council for Scientific and Industrial Research gives an interesting summary of the research situation in Canada in regard to the application of science to industry.

Reconstruction and development in Canada in the new era of international girding for supremacy in the arts of peace means to the Canadian Honorary Advisory Council for Scientific and Industrial Research much in so far as development is concerned, but little in regard to reconstruction. Reconstruction postulates the building up again of what existed before, and up to the outbreak of war there was constructed in Canada no national organization for research work. The glowing path of Canada's opportunity for industrial development runs wide and far, but the council's research path has to be blazed through a comparatively unexplored forest. It is almost entirely new ground to be covered.

Where Germany, and, though perhaps in lesser degree, the United States, had built before the war great organizations for industrial research, founded on wide-visioned realization of the commercial value and necessity of applying science to industry, in Canada, as in Great Britain, State encouragement and individual enterprise had, until the war started, been content in the main with a "laissez-faire" policy. Germany had her trained technologists and research workers by the thousands in every field of industry, and, through the organized application of science to industry, was winning her trade victories in every foreign mart.

In Canada in a score of years less than twenty students have received the advanced (Ph.D.) degree in science from the University of Toronto, and fewer still from McGiill. Not two per cent. of Canadian firms have research laboratories, and only about ten per cent. have routine laboratories, chiefly for the testing of materials. If Canadian industries were to seek for a supply of trained technical men capable of applying the most advanced scientific knowledge to industrial processes sufficient to meet even their most ordinary needs, the number of adequately trained men available would not be sufficient to satisfy five per cent. of the demand.

That, briefly put, is the situation with regard to the needs in Canada for equipment and men for research work. That is the situation which has confronted the Research Council since its creation in December, 1916. And that has been, and is, the crux of all the problems of scientific and industrial research in Canada, handicapping the carrying out of the large research programme planned for the past year and for the coming year, jeopardizing Canada's position in the international rivalry for export trade and demanding prompt remedy if the full measure of our opportunity is to be grasped. In resources of capital and materials, in all the natural advantages for industrial supremacy we are in an enviable position as compared with our trade competitors, but in regard to the vital question of scientific organization of our industrial processes, of finding new uses, and hence now markets, for the raw materials and the by-products of manufacture, and of keeping pace with the advances made in other countries through research, we have as yet hardly touched the fringe of opportunity.

Confronted with this situation and with a slowly awakening public and individual realization of its portent, the main task of the council this past year has been, while carrying on the immediate needs of research work with the means at hand, to pave the way for meeting adequately the urgent needs of the future. The goal has been a supply of trained men for research work, adequate equipment and facilities for research and the enlistment of industrial organizations in co-operative effort to solve common problems, the solution of which lies in the application of science to industry. The great forward step taken has been to promote the establishment of a Central Research Institute at Ottawa, combining the functions of the Bureau of Standards at Washington and of the Mellon Institute at Pittsburgh.

The proposal for such an institute, submitted to the Government in November last, was the result of many months' careful investigation by the council. In view of the situation above outlined, the argument advanced in support of it is so obvious as to need no restatement here. There has been a prompt and appreciative response to the proposal by the Government and by all the public interests concerned. There is good reason to believe that the institute will be established without any unnecessary delay. It will involve an expenditure of $500,000 for a four-storey building, having initial provision for fifty laboratory rooms, and with plans so drawn as to provide for expansion as the needs develop. The cost of the scientific equipment is estimated at $100,000, and the cost of maintenance, salaries, etc. at about $100,000 per annum for the first few years.

The establishment of the institute is the necessary first step towards placing industrial research work in Canada upon an adequate and permanent basis and towards enabling the Dominion to keep abreast of similar progressive methods in the United States, Great Britain, Japan, France, Australia, and our other trade competitors. It will, doubtless, be followed by the organization of trade guilds or associations for research in each branch of industry, formed to pool resources in solving common problems and to take advantage of the laboratory equipment and opportunity offered, under the council's proposals, by the Government-maintained institute.

A further necessary step will be the working out of the council's plans for more adequate provision by the universities for the training of qualified scientific workers. In the more generous investment of State funds for this purpose, starting say with Toronto, McGill, and l'Ecole Polytechnique in Montreal, lies the hope of securing for the ensuing years of the world's strenuous and pitiless trade warfare the nation's leaders in scientific and industrial research.

There have been a score or more phases of industrial research initiated or continued during the year, each having a practical bearing on some branch of national production. More should and could be done, were trained men and money available. The council's budget for the year has been under $100,000. In Great Britain, Parliament has recognized the need and the opportunity by creating a separate Department of Scientific and Industrial Research, and has voted one million dollars per annum for five year to be expended by the Research Council. In Canada we, too, are learning the obvious lesson taught by Germany and already adopted by British industry. The path has been blazed for replacing rule of thumb methods in Canada by scientific investigation.

Kelly Reamers and Production Tools is the title of a new catalogue issued by the Kelly Reamer Co., of Cleveland, Ohio. This catalogue is descriptive of the Kelly Floating Reamers and Production Tools with adjustable and replaceable high speed steel blades for machining of steel, iron, bronze and aluminum. They are used extensively in the machining of engine cylinders, crank cases, transmission cases, auto parts, pumps, connecting roads and tools, etc. The many combinations that may be obtained in tools of this type make it impossible for the manufacturer to illustrate and list more than a small portion of them in the pages of the catalogue, but representative types of reamers are described in extensive detail. The principle of operation is very clearly shown and the incorporation of the various units into multiple tools is treated of in a very interesting manner. Various arrangements are shown in which the tools are set up for various operations upon standard makes of machines, and also their use is shown in the operation of single purpose machines for various classes of work.

Captain George W. Purdy, of Plymouth, Yarmouth county, reached his home last week after an absence of over six years.

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The Debt to the Navy

WHEN all the factors are lined up that had to do with the winning of the war, it might be well to make certain that the work of the Allied navies is not overlooked.

With all due allowance for the splendid assistance of the navies of the other Allies, and for the wonderful feats of arms, it is a cold and undeniable fact that had it not been for the British navy, Germany would have long since been dictating the lines on which the new Hun-made map of Europe would be drawn.

The navy protected the tremendous shipments of munitions that went from this continent, looked after the supplies, got men to the continent to keep the German war machine in check, made possible the operations that held the east loyal, and foiled the plans of the enemy there, kept the trade routes open so that the Allied nations were fed.

Canada is tremendously interested in marine activities. The commerce of this country had a chance to see what would become of it were shipping cut off or seriously curtailed.

It is well that at the outset the country should recognize that there are greater things at stake than tonnage costs.

Canada is reaching the stage where her own merchant marine is a national necessity, and we are moving toward the supplying of that need.

It is hard for many Canadians, who for the most part are "land lubbers," to feel and realize the necessity of complete efficiency in marine matters.

The war period has been an object lesson, and if Canada reads and marks it, she will do well.

No nation can be reliant and self-contained without a complete transportation system, covering both land and water systems.

Germany is "Out of Bounds"

PACIFISTS may try as much as they wish to seek easy terms for Germany in the making of peace, but every day that passes adds new evidence to the hell that has been turned loose in the name of German junkerism.

The man who would go out and preach hatred for the German simply because we had been at war with the German would be a fool and a traitor, but the man who can read the accounts of honest men as they describe what they have seen, and not have his whole being boil with indignation, is devoid of the semblance of manhood.

The anti-German feeling is growing without any urging. The chances are that we have not felt the full force of the movement. Remember we have some hundreds of thousands of soldiers who have yet to come home. These have seen atrocity in its worst form. They have come into contact with those that have felt to the limit the heel of the Hun. They have had an experience that a thousand years could not efface. And as these men come home, they will tell their experience. They will touch circles that have not been moved, and they will start influences and feelings that have been lying dormant. It will all grow into a tremendous anti-German feeling.

Germany stands not simply as a defeated country, but as an outlaw in the courts of civilization and an exile from the halls of decency. The murderer cannot wash his hands of the blood of infants and mothers, nor can the assassin come back into the company of decent men.

It's wasted effort carrying on a campaign against Germany and German goods. Germany's butchers in the last four years have blasted Germany's chances of getting a hearing in the commercial world.

Reporting the Peace Conference

NEWSPAPERS from this continent are sending some 1,500 correspondents to "cover" the peace conference in Europe. No doubt each and every one is going over primed with the notion of writing a story that will set the people by the ears.

There's nothing now to hinder them scribbling away as hard as they please. They can blaze ahead and burn up the heather in advance, but the wild scramble is yet to come. When the conferences really start in earnest there will be a demand at home for cabled stories at the close of each session.

Remember, there are some 1,500 correspondents. After official and commercial business for the day gets off the cables there are some half dozen wires open for the correspondents. Of course correspondents, like reporters, are apt to stand aside and beg of their rivals to step in and send their stories first.

It looks from here as though these 1,500 correspondents with six wires amongst the lot would be sufficient to start the war all over again.

Eastern Canada Marine Activities

Doings of the Month at Montreal and on St. Lawrence River

(September Correspondence)

THE Montreal Board of Trade are anticipating an early removal of the restrictions that have been a feature of import war trading. The matter has been taken up with the Government at Ottawa, and Sir Thomas White, the Acting Premier, has promised to give the question careful attention. The War Trade Board has advised the Montreal Board of Trade to this effect: "The restrictions complained of are at present under consideration, and, as soon as the members of the newly-formed Canadian Trade Commission consider the matter an announcement will probably be made. Meanwhile we may inform you that it is expected that practically all the restrictions in regard to imports will be removed, and that only a small proportion of the export regulations will be retained." The same ruling virtually applies to the export and import of all foodstuffs, as the Canadian Food Board has announced its intention to remove existing war restrictions as soon as possible, providing such return to normal will not effect the general reconstruction.

In view of the development of a Canadian National Merchant Marine, the Board of Trade here are endeavoring to have the Government recognize the advantages that would accrue from the establishment of a fleet of several small vessels to ply between the Port of Montreal and St. John's, Nfld. D. B. Hanna, the president of the Canadian National Railways, which will control the marine activities in co-operation with the rail transportation, has stated that the National Railway Board are now considering the entire policy respecting intercontinental steamship business, and announced their willingness to favorably consider the request of the Board of Trade in regard to the establishment of a river service between the two centres

The eight wooden vessels now under construction by the Fraser Brace Co., for the French Government, are in various stages of completion. The hull of the first laid down is nearly finished, and it was expected that this one would be floated some time this month, but it is not likely that this will be done at an early date, probably not until the break-up in the spring. These boats will be fitted with twin screw, triple-expansion engines. About 900 men are now employed at the yard, and it is anticipated that the eight vessels will be delivered before the close of the 1919 season.

Early in the month the plant of the Canadian Vickers at Longue Point was the scene of a riotous gathering to protest the action of the management in taking on a number of returned soldiers. The disturbance, however, was of short duration, as Chief Wells, of the Vickers police, soon brought the crowd to a reasonable state of mind, convincing them of the justice of the claims of the returned men, stating that it was the policy of the company to give preference to returned men, but others would be taken on as soon as expected material arrived. At present work is proceeding satisfactorily on several 8,000-ton vessels for the Canadian Government, and the launching of these is expected early in the spring or as soon as it is possible to launch them in the river.

Necessity has naturally been a very strong factor in placing a temporary ban on many pre-war projects that were in course of development prior to 1915. Some of these are again being revived, and one that is of considerable interest to the people in this district is the proposal to construct a bridge over the St. Lawrence River at Montreal, using St. Helen's Island as a central stepping stone for connecting the South Shore with the city. It is estimated that the construction of a bridge at this location would involve an expenditure of $5,000,000, apart from the changes that would be required in and about the harbor before the scheme could be successfully carried out. The delegation of South Shore residents, when conferring with the Harbor Commissioners, were advised of the support of that body, but the latter point out the various requirements that would be essential to the carrying out of the project. One of these, probably the most important, was that the existing Lachine Canal locks would require to be located further west, and, owing to the fact that the canal is Government property, the promoters would have to persuade the authorities at Ottawa of the advantages of the bridge and the desirability of giving these facilities. The scheme would also entail the extension of the Bickerdike Pier and the new Pier No. 1. A representation of interested parties will interview the Government and make application for an early appropriation for the commencement of the work. One of the arguments in favor of the bridge is that the work would materially assist in relieving the possibility of unemployment that may develop during and following the demobilization of returned men.

The Montreal aqueduct is again in the limelight. The request of the Commissioners for a further appropriation to enable them to obtain a new expert report on the entire scheme has resulted in the city council granting the sum of $25,000 for the purpose.

The relatively open winter so far has enabled considerably more progress to be made in connection with shipbuilding in this district than in past years, especially where these operations have been carried out in the open. This has been particularly emphasized in the work of fitting out the "Canadian Voyageur" in the harbor of Quebec. It will be remembered that this vessel, the pioneer boat of the new Canadian Merchant Marine, was launched from the yard of the Canadian Vickers about the first of December last year, and subsequently transferred to Quebec, to permit of her being placed into service this winter, a condition that would have been impossible had the fitting out of the vessel been carried out at the plant of the builders owing the the freezing of the river. The "Canadian Voyageur" is scheduled to leave Quebec for overseas on the 20th of January, which will not only represent a record for late departure from the Port of Quebec, but will likewise be the maiden trip of the first vessel of the Canadian National Merchant Marine.

Traffic in Lachine Canal

Navigation on the river and through the canals closed later in the 1918 season than ever before in the history of inland waterways. The first vessel down was the "City of Ottawa" from Hamilton on 30th April. The last freighter westbound (up) was the S.S. "Haddington," on 10th December, and the last clearance was the steamer "Natironco" from Buffalo, westbound for Halifax, which passed through on the evening of 17th December. The duration of navigation in the canal was 239 days. Vessels reported numbered 709, and were of the following description: Canadian steam, 184; American steam, 223; Canadian barges, scows, etc., 152; American barges, 12; American canal boats, 138; total tons burthen, 453,213. Of these vessels 258 passed out to harbor and did not operate in the canal during the season, this number including 59 Canadian steam; 190 American steam; 8 Canadian sail; 1 American sail; total tonnage, 303,079; thus leaving a total of 451 vessels, combined tonnage 150,134 net tons burthen, which operated in the canal during the season of 1918. Twelve vessels in two parts came down through the canals and were put together in the harbor. The total number of trips reported was 6,792, combined tonnage 453,213, making a total of 3,669,283 net tons burthen reported for the season, and carrying grain and miscellaneous cargoes amounting to 2,929,121 net tons.

As compared with the previous season, the total number of vessels (709) showed an increase of 102; but the returns of net tons of grain and miscellaneous cargoes carried, showed a decrease of 406,822. The requisitioning of many of the older and larger freighters for war service overseas was largely responsible fo this falling off. Of wheat, for in-

stance, there was carried in 1918, 5,067,139 bushels as against 13,201,732 bushels in 1917, and for oats the figures were 3,572,166 and 4,752,649 respectively. The total decrease in grain carried was 9,101,851 bushels. Of coal there was carried 1,581,895 tons (soft) and 342,206 tons (hard' of pulpwood up to Canadian ports, 15,278 cords; pulpwood up to American port, 66,701 cords; pulp to Canadian ports, 1,425 tons; to American ports, 49,948 tons. Produce carried included 6,428 cases of eggs; 7,185 packages of butter; 229,952 boxes of cheese; 9,119 barrels of apples, and 306,745 sacks of flour. The produce in all these items except eggs, showed an increase. Lumber from Ottawa for U. S. ports per American canal boats was 45,478 tons, or 27,286,800 feet B.M., an increase of 4,821,600 feet B.M. Lumber discharged in canal basin: up, 14,346 tons; down, 10,777 tons. Sand, up, 17,332 tons; down, 61,005 tons, a decrease as compared with 1917, of 47,882 tons. Let passes issued: 3,788; lock-master's tickets, up, 577; down, 2,083; permits to pleasure craft, 102.

The number of passengers carried through the canals and down the Rapids was 45,362; decrease on previous year of 24,548.

Judging from the great activity of the harbor in connection with the forwarding of supplies overseas, it would appear that the reason for the Lachine Canal not participating in more of this business was the shortage of shipping and the difficulty of replacing the smaller craft which were diverted elsewhere for war service.

For obvious reasons the operations in and about the Port of Montreal have been carried out under more or less secrecy during the past few years, and therefore it will be interesting to relate some of the incidents in connection with the "closed" port, during this period. Virtually no passenger traffic was permitted during the season of 1918, the activities being confined to the handling of supplies—men and materials—for war purposes. The total of transatlantic vessels arriving at the port during the past year, was 674, a record showing, and owing to the character of the tonnage carried the gross revenue was the largest in the history of the harbor. The gross tonnage of these vessels was about 2,000,000 tons. The report of the season recently closed showed that larger and deeper draft vessels came to the port than ever before. An interesting feature of the year was the large number of boats flying the American flag that sailed from Montreal. A great number of these were built at yards situated on the shores of the Great Lakes by the United States Shipping Board, and afterwards brought down through the Lachine Canal.

Victoria, B.C.—The boilers for the twenty ships being built for the French Government by the Foundation Company will be made by the Vulcan Iron Works. The order amounts to about $1,000,000.

GOSSIP FROM THE PACIFIC COAST SPECIAL TO MARINE ENGINEERING

SHIPPING matters are very much to the fore in British Columbia, more especially in this port. Development of Vancouver's harbor, including the establishment of a drydock to handle repair work, increased dockage facilities and many other improvements, are being urged. The absence of a drydock in this port, it is estimated by one very prominent shipping man, lost to Vancouver last year alone, no less than $1,500,000.

It is in shipbuilding, however, that the greatest stir is noticeable. With the cessation of hostilities Vancouver found itself in the fortunate situation of having no munition works to transform into commercial factories and shipbuilding, practically the only war work it had been engaged in for nearly a year, took on an added impetus by the arrival here of more men seeking work in the yards.

Although only a little over two and a half years old, none will deny that shipbuilding is British Columbia's leading industry. Just what it means to Vancouver alone was well indicated in the strike just settled at Coughlan's shipyards. The men were out 10 days and in that time, it is estimated by the firm, the men lost over $150,000, which doubtless, would have been disbursed during the Christmas trade. A feature of the Coughlan strike, by the way, was the fact that the 3,000 workers went out a couple of hours or so before the War Convoy, the sixth steel hull to be launched by the Coughlan firm, was due to slide down the ways. The foremen and the officials of the firm, however, launched the vessel on time without a hitch.

In the short time this province has been in the shipbuilding industry, in the neighborhood of 180,000 tons of shipping has been added by local yards to the mercantile marine, and there is still another 140,000 tons now on order in the various yards. The vessels launched so far have been mostly wooden, with the exception of the six launched from Coughlan's slips, all of these boats being 8,800 tons, and three from the Wallace yards, all of the 4,800-ton class.

The launchings carried out by the British Columbia yards up to the present, are as follows: Cameron-Genoa yards, six 2,500-ton wooden auxiliary schooners, and four wooden steamers; Wallace Shipbuilding Co., six 2,500-ton wooden auxiliary schooners and four 4,800 ton steel steamers; William Lyall Shipbuilding Co., seven wooden steamers of the 2,800 class and five auxiliary schooners of the same size; Western Canada Shipyards, six wooden steamers, each 2,800 tons; Foundation Shipyards, five 2,800-ton wooden steamers; Pacific Construction Co.. four 2 800-ton wooden steamers; Coughlan & Sons, six steel steamers of the 8,800 class, and the Westminster Marine Railway two large tugs for the department of aeronautical supplies.

The launching of the War Convoy at Coughlan's took place on December 18 without a mishap, Miss Dorothy Lee, daughter of Mr. and Mrs. Frederick Lee of Spokane, acting as sponsor, and a large number of prominent shipping men being present also.

The Cap Vert, the fifth wooden auxiliary schooner to be launched by Lyall's, was launched December 9, Miss Dorothy Martin of North Vancouver being given the honor of acting as sponsor. Like its predecessors this vessel is for French interests, and the keel for the sixth French vessel was laid immediately.

The third recent launching was that of the wooden steamer Antonius at the Pacific Construction Co.'s yards at Coquitlam, Mrs. H. A. Barnett acting as sponsor.

As far as wooden vessels are concerned, W. S. D. Cook, manager of the Wm. Lyall Shipyards, takes a decidedly optimistic view of the future, declaring in an interview that there will be a shortage in the world's tonnage for the next 10 years, an opinion, he says, which has been substantiated by some of the largest shipbuilders in Europe. Of the 21,000,000 tons of shipping sunk since the war started, only 14,000,000 tons have been built to replace it, he says. The difficulty in securing steel is what he bases his prediction upon regarding the brilliant future for the wooden shipbuilding industry in this province.

The Vulcan Iron Works of Vancouver has just received the contracts for the boilers for the 20 vessels being built by the Foundation Yards for the French Government. The order, which amounts to $1,000,000, was tendered for in the open market.

One of the Greatest Men of the War—although but little has been said of him—is Captain E. P. Jesop, of the United States Navy. Capt. Jesop put 500,000 men in France, saved the United States same $20,000,000, and put the German interned ships into operation a year ahead of the time anybody had a right to calculate that they could be put into commission. Captain Jesop did it all with an idea. The idea was that the broken parts of the engines of the German ships could be repaired by electric welding.

New York.—United States shipping men are beginning to feel some anxiety with regard to the future. They are convinced that very keen competition will have to be met with the other maritime nations, especially Great Britain. After expending $3,000,000,000 in the construction of shipyards, in building and equipping ships, it is far from a certainty that the United States can compete successfully with the merchant marines of other nations.

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"*

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

A GENERAL description of charts will lead us on to a better understanding of coasting navigation and dead reckoning.

Charts are simply marine maps, representing a part of the globe. The part may be all sea or sea and coastline according to the vessel's position. A clear exhibition of islands, shoals, banks, rocks and soundings, with the variation of the compass and other nautical data is given. Again, perhaps the lighthouse and lightship are amongst the major items on the coast part of the chart, whilst the tide arrows and the buoyage systems are also very important.

The symbolic art is much in evidence to show the mariner where a coast is cliffy, wooded, or otherwise, and the illustrations given herewith should make it plain to the student that the sooner he gets a chart and studies it the easier will be his coaching and examination periods.

The Mercator Projection

For general navigational purposes the Mercator chart is universally adopted. It is practically useless in high Arctic or Antartic waters, near the poles, but commercial shipping use it as far north and south as the 75th parallel of latitude. Vessels outside of that area are well fixed in other ways as far as their position is concerned, for they are exploration craft loaded to the gunwales with scientific men and instruments.

Compared to a Globe

On a globe the parallels of latitude are everywhere equidistant, while the distance between the meridians lessens on proceeding polarwise. Thus, if on a plane surface the parallels are retained equidistant while the meridians are widened out at the poles, there must be distortion in longitude. But the difficulty is got over by making a proportional distortion of the parallels of latitude. The result is the Mercator chart, which has the task of depicting a spherical surface on a flat sheet of paper.

On a Mercator chart all the meridians are parallel and the longitude degrees are the same distance apart. Hence the track of a ship always steering the same course can be drawn as a straight line. If elbows are required in the courses, then a series of straight lines appear.

Mercator's chart has been compared to a cylinder unrolled. A cylinder that could circumscribe your model globe and project beyond the poles. A rhumb line on a globe is curved, but it is straight on a Mercator chart.

A plan is a chart that comprises a detached part of an ordinary chart, but is made to a large scale for navigating into a harbor, roadstead, river, estuary, or where sailing is intricate.

Use Chart Like a Book

Always spread out your chart with the north part of the world at the top, which will put the east side to your right and the west side to your left.

If your longitude increases to the right such as 20° 30° 40° its name is east.

If the opposite was the case and the degrees of longitude read 40° 30° 20°, then you would be in western waters.

If the Greenwich meridian passes through a chart then you have the longitudes showing thus: West 20° 15° 10° 5° 0° 5° 10° 15° 20° East.

Measurement

The distance between two places must always be measured in the graduated meridians at the extreme right or left of the chart, never at the top or bottom. Moreover, you must always use the dividers abreast of the ship or places in what is known as the middle latitude. Thus you get the true distance.

For instance, if the measurement was on the diagonal and lay between the parallels of latitude 40° and 50° you would stretch the legs of the dividers to, say a hundred mile division, with the 45th parallel running through the centre.

The only time you go into the top or bottom (graduated parallels) of a chart with the dividers is when you wish to find out what longitude your ship or port is in, but never, never make measurements there.

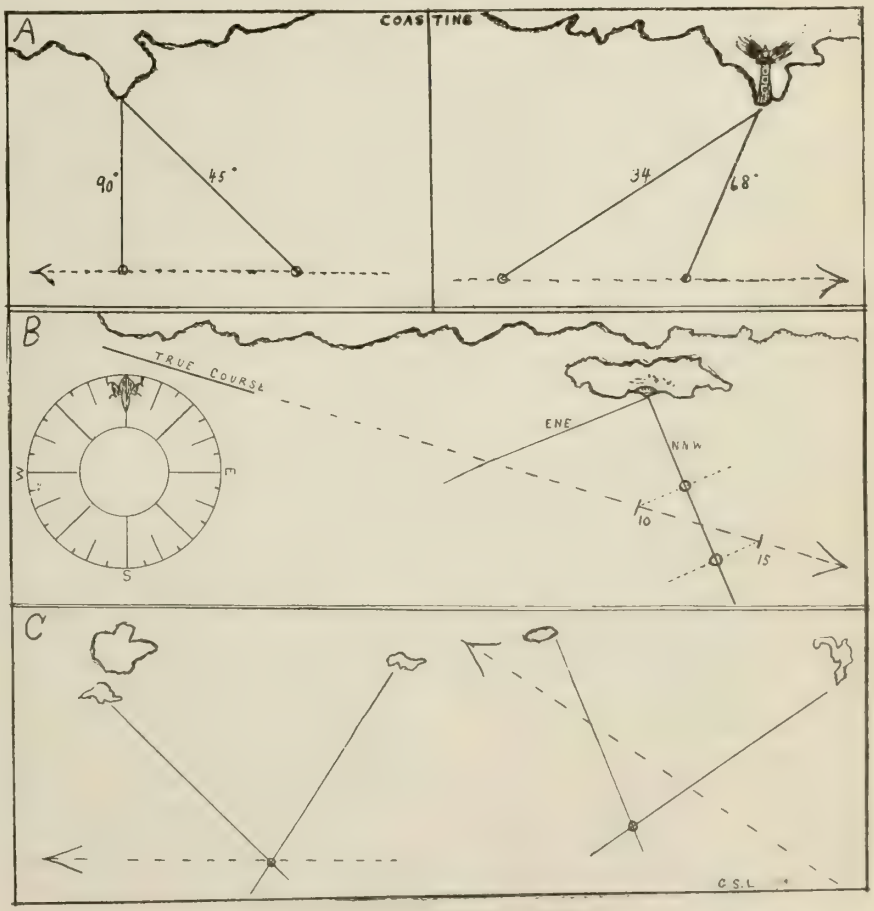
Chart work is very interesting to the average beginner and is not therefore so hard to learn as the Rule of the Road or the memory work. Every prospective mate should get a pair of parallel rulers and dividers—sometimes called compasses. Then, with a lake or ocean chart—cheap enough articles—he can practise and make perfect.

The hydrographic offices who make up the charts give some definite information on each chart which puts the student clear as to the data marked thereon.

The contractions for the soundings may be marked, such as oz for ooze, sh for shells, or cl for clay, and many more. Where the chart was marked in fathoms and you noticed 20 with f.w.s. under it, that would mean that the water was one hundred and twenty feet deep, and the nature of the bottom was fine, white sand.

Then, if you saw a deep sounding such as 888 with a dash and a dot over it, thus $\dot{\bar{8}}\dot{8}$, that means that the sounding is short rated and that the water is actually deeper than the figures quoted.

The lights on a chart you will notice are marked with a little red dot in a yellow smudge, and contractions are



LAYING OFF CHART COURSES.

given for the nature of the light such as Gp. Ff = group flash, or Rev. = revolving, and F stands for fixed. There are other names, too, and flag or wireless stations are also set down in connection with lighthouses and lightships.

Lines of variation—the earth's magnetism—are shown in snake lines all over the charts, and compass impressions, or roses as they are termed, are put down here and there for the navigator's use, and he must use the nearest one if it is a short distance course and he is taking off a magnetic direction.

Where your course runs at right angles to a number of variation lines you can strike a mean course. In chart practice it is best for beginners to work out a set of true courses and distances and then a set of magnetic courses and distances. The application of deviation and variation was shown in a late article, but I may remind you that the courses run in this fashion:

From chart to man at the wheel; true, magnetic, compass.

Now a bearing of the land for plotting would just go the opposite route: Compass, magnetic, true. Then you can at once notice that the corrections will require to be differently applied in these two cases and that is where the trouble is.

When applying deviation and variation to a compass bearing, easterly named goes to the right, westerly named goes to the left. But the same corrections applied to a true course from the chart go the opposite way on their road to the quartermaster.

Example

Assume

Variation 5° W
Deviation 10° E

Error 5° E

True course S 60° E
Variation 5° W = to right

Magnetic course S 55° E
Deviation 10° E to left

Compass course S 65° E

Now reverse this example and you will catch the idea:

Compass course S 65° E
Deviation 10° E = to right

Magnetic course S 55° E
Variation 5° W = to left

True course S 60° E

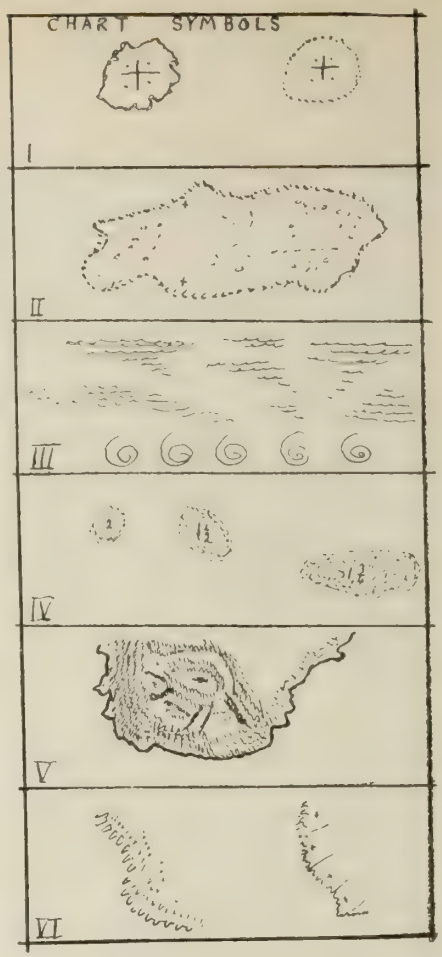
That is the whole thing in a nutshell as far as chart practice for a beginner goes.

Bearings

This phase of chart work have de-

This phase of chart work I have dewhich I will now try to explain in lucid fashion. The four and three point bearings in A do not require chart plotting, but the others do.

A. This is the good old "four point bearing" method of finding the ship's distance from the adjacent coast. The isosceles triangle method it is sometimes called, and for simplicity it has no equal. One of the pleasing features of this



"doubling the bearing" calculation is wrapped up in the fact that one can do it without leaving the bridge.

The dotted lines represent the ship's course. In the left hand example, when your craft has the point of land bearing four points (45°) on the bow, you note the time and read the log. Then, when the point is abeam 90°, note the time and read the log again. The distance run in the interval just spoken of is the distance that your ship is off the promontory at second bearing.

The example to the right in A shows you how the same trick works out in a three point (34°) bearing. These two, as shown in the drawing, are the least erroneous.

Small bearings near the ship's head are not used, but the following approximation near the beam is worth remembering.

Say that in thick weather you suddenly spy a light or lighthouse nearly abeam, and wish to know your distance off. Bring the object abeam and steer a straight course till it bears one point (11°) abaft the beam. The interval in distance is your distance off when multiplied by 5 Such a position would be a rough departure. You can work this dodge from one point before the beam if you can afford to, and in either case the distance found is the distance that the ship is off when abeam.

B. In this diagram you need the chart as well as the compass. The true course is E by S ½ S. Position by two bearings of the same object.

First bearing of island mountain is E N E true. After running on the same course, say 10 miles, the mountain bears N N W true. Lay off your ten miles from your first bearing; then, with parallel rulers bring down the dotted line parallel with E N E, cutting the second bearing in relation to the 10 miles. Where the dotted line and second bearing intersect is the ship's position, which shows that she is about 3 miles to the northward of her prescribed course, not an unusual thing.

For further illustration, make it 15 miles between first and second bearings of the same object and we find that she is about 3 miles to the southward of her supposed position.

In real practice you would have to bring the original compass bearings to true bearings before plotting them on a true chart, or again, you would have to make them magnetic if using a magnetic chart. And here I might say that the difference is not in the chart itself, but simply depends on what "rose" or compass impression you work from. Ships' positions on charts are always marked with small circles as shown here.

C. The cross bearing by two objects, in this case islands. True course is due west.

Diagram to the left. First bearing is N E by N, and taken at the same time the other bearing is N W. When plotted, their intersections show that the ship is really where she ought to be, right on her course as laid down on the chart.

C, to the right. True course is N W by W.

One bearing is N N W true, the other N E by E true. Their intersections show that the ship is considerably to the southward of her supposed line or course.

Where tides interfere with the operations of such work, act accordingly, also remember that practice only, whether as a student aspiring to a license, or a young officer on the bridge of a vessel, will give confidence and valued experience.

Work out all the methods frequently in the fine clear weather, then when a Belle Isle fog comes along to greet you, if you get half a slant you can take advantage of it and find an approximate position.

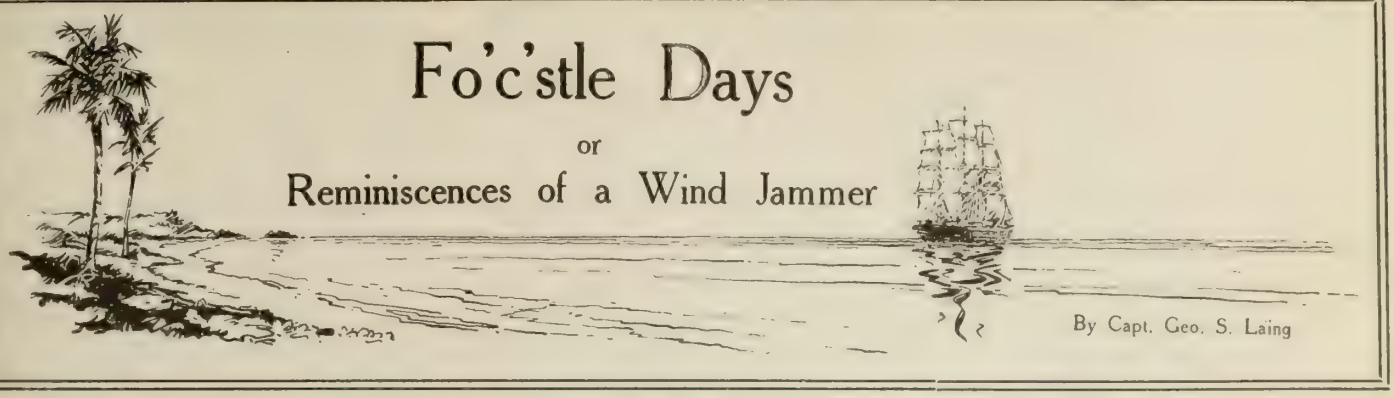
Some Chart Symbols

I.—Rocks awash at low water.
II.—A limited group of rocks.
III.—Eddies and tide rips.
IV.—Shoal banks which do not uncover.
V.—Bold land and deep water.
VI.—Coral reefs.

Caution

In chart A you do the work by bridge compass, time, and log, and have no troubles with variation and deviation.

In B and C, remember when using variation that it is a local quantity applicable to all points of the compass in a stated amount, while deviation alters for each point of the compass, and when used in connection with bearings it is the deviation on the ship's head that you apply to the bearings to make them magnetic. Be clear on that point.



Fo'c'stle Days

or

Reminiscences of a Wind Jammer

By Capt. Geo. S. Laing

The steamer and the motorship have deprived the seafarer of much of the old-time romance attaching to a sailor's life. The advent of wireless has also increased the safety of it. Deprived of these features, a sailor is immediately dependent on his own resources, and Captain Laing gives us a true and seaman-like reflection of sea life under canvas. The present feverish activity in constructing self-propelled craft affords a suitable background for incidents in a career in which gaffs, booms, tar and canvas held sway before being displaced by mechanical unloaders, derrick masts, fuel oil, coal and wire rope.

CONCLUSION

THE old man soon appeared on the mole and hailed Hank, who was taken ashore and introduced to our supply dealer. This procedure allowed Hank to call every morning at the store and receive the contract amount of fresh meat and vegetables, etc., for the "Maggie Dorrit." The purveyor's name was English, and he wasn't afraid to be real English in his liberality to the apprentices. This famous coast, like all other foreign strands, was dotted here and there with British miners, merchants, and adventurers, as well as deserters from the mercantile fleet.

Some nights we had to lay off the mole till midnight, and occasionally till early morning, waiting on the skipper, and perhaps two or three other night hawks belonging to the "Liffey" or other craft. We liked the boating best, however, when in attendance at some social function on board of a strange ship. In such a case we let our boat ride clear of the ship's side from a foreyard painter, or passed the little craft astern, where she could do no damage to herself. Then we could fraternize with the other apprentices, whilst the old man was entertained with wine and smokes among his own class down aft.

Our beach-combers managed to get ashore in a barge, and some of the "Liffey's" blue jackets filled them up with native distilled firewater. After a night in the "calaboose" or jail, they were brought on board by the captain of the port and put to work in the hold, where their chance of escape would be less than it was when working the crab winch on deck.

Surf and Saint Days

All Chilian ports are famed for surf and saint days. Surf days are days on which the barges could not, with safety, load or discharge owing to sea disturbance. On such a rock-bound coast and with such deep water, the rebound of the open ocean is considerable, and even in the finest weather it is customary in some west coast harbors to moor all barges with spiral-buffer hawsers to allow for the surge. Demurrage claims are therefore a farce, as the merchants simply order their own weather in effect. Saint days have, of course, a religious significance interwoven with fandango and wine, a prescription that can only be filled to the brim in a country saturated with the church authority, so apparent in Latin-reared communities

Our Australian coal was discharged in the usual erratic way, and a cable arrived to say that we had to proceed north to Caleta Bueno for a cargo of saltpetre for Bordeaux in France. The fact struck us at once that such news made the Maggie Dorrit a "homeward bounder," for there was always the possibility of loading on the Chilian coast for a United States port and thus avoiding Great Britain or Europe for two or three years.

A Visit to H.M.S. "Liffey"

One Sunday the captain offered the apprentices the use of the boat for the whole day, so we visited the British man-o-war and had a good time. This wonderful old ship, named after the Irish stream, was a real curio for us to wander over, and the sailors and petty officers were exceptionally nice. Boy-like, we "followed our nose" till we came to the galley, as the smell from that interesting spot acted like a magnet on merchant service youngsters. "Wooden walls" has a literal meaning, indeed, when one sprawls out flat in a port hole of such a craft and throws back the memory to close range guns and boarding parties, not forgetting the cutlass crews, and the burning masts and yards, all in fearful disorder during close conflict. Such vessels were the protectors of our Empire until steam and metal science took charge of such work. All craft of the "Liffey" type must be honored as indelible cogs in the wheels of evolution—for they did their particular bit in their particular day. Throughout the water of our far-flung Empire we can still see a few of the Nelson craft acting in various capacities, the most dignified purposes to which they are put is, perhaps, that of a training ship or foreign station store ship, like the "Liffey." Others, however, have fallen in status till they are used as coal hulks, floating prisons and so on, whilst the writer spied one in Hong Kong a few years ago fulfilling the duties of a hospital for seamen.

There was no picnic ground on the fringe of Coquimbo Bay, so we had no camping excursions, such as one can enjoy in places like Rio de Janeiro. After leaving the "Liffey" we put in the day chasing sea lions and visiting a machine shop that lay close to the beach to the south of the store ship. The Lord's Day Alliance had not arrived at this port, so, to a great extent, work of a mechanical nature flourished on every day of the week. As usual, the indomitable Scotchman was found amongst the machinery. Wherever wheels and smoke are at work one finds the canny "Sandy" in India, China, South America, and all over. There he is with the proverbial piece of waste in his hand, and his thin, alpaca cap almost burnt away to the peak with rasping hot valves or entering back-ends of boilers.

Boating Stunts

Fid's brawny muscles were soon in demand at the cargo winch, so Hank and I were left in charge of the boat. Our seamanship, when the captain was not with us, had a humorous side to it. Many a time when a fair wind happened along we spread an old ensign out with boat-

hook for a mast and spun-yarn sheets—and, boys, couldn't she go? To hold the yoke lines of the rudder at such times put an impulse into one's veins that only youngsters could feel the tingle of. This improvised rig was no use close-hauled, or we would have had more constant fun from it.

In due course our "stiffening was aboard," which means the first of the ballast, thus assuring the safe discharge of the entire coal cargo. A day was therefore in sight that carried the significance of a carnival to all "west coast" seamen. On the morrow our last pound of coal was to pass down the chute. Such an ordeal wouldn't excite ordinary mortals, but in Chilian ports the crews of vessels looked upon this stage of the game as a high day and holiday. It was so important to get a cargo out or in that rejoicing was rampant.

"Blow the Man Down, Johnny"

When the last basket of coal was flush with the staging over the hatch, a seaman stepped on, accompanied by a broom and shovel. The outfit was then hoisted right up to the gin or whip-block. Then a wild sea chanty was roared out as the basket was lowered. Naturally, the steward awaited the signal to hand round the aromatic brandy, which every man tossed over his gullet with graveyard solemnity for fear he should spill a drop; and who knows but it might have taken the copal varnish off the companion scuttle if he had? Those fiery grogs were served out twice a day to the crews on this coast, but on a day like the one in question, extra allowances were thrown in Jack's way to make him think that he had struck a hotel. The reader must remember that with the exception of one day's shore leave, the entire crew, bar the skipper and boat crew, had to spend something like eight or nine months on the vessel without having any freedom on land. Chilian ports are open roadsteads where ships are always at anchor, so that occasions that are commonplace in more civilized quarters, become giant happenings on this interesting rock-bound strand. When our saltpetre cargo is all aboard, further rejoicing will be described.

For some reason or other the two beach-combers utterly failed to get away from the vessel for good. It took a large port like Valparaiso or Iquique to hide those rascals in their degredation. The port authorities of Coquimbo and the "Liffey" sentries had too firm a guard on the low dens of the town, so eventually we sailed up the coast to Caleta Buena with the same crew as we left Australia with.

The short coastwise run was pleasant and uneventful, and we soon entered what appeared from seaward to be a precipitous mountain rising abruptly from the ocean. If this was a harbor it only required a breakwater with a sweep of 300° to protect it.

As we rolled inshore, the masts of the shipping were picked out against the mountain, and with little or no welcome the "Maggie Dorrit" dropped her hook and swung head out to the Pacific Ocean. Three other wind-jammers were loading nitre, and one of their jolly-boats came alongside to ask if they could purchase any salt meat from us, their own stock having got low for the homeward passage of four months to Great Britain.

Caleta Buena is a typical nitre port, and is about as inviting a spot as the desert which one sees in passing through the Suez Canal. Of course, the mine agent came on board and changed his breath, and saw that our holes were ready for the great fertilizer.

The valuable deposits are surface-mined about 60 miles inland and brought by a spur-line to the coast. The coast mountains support a wonderful plateau about 700 miles long, and it is within this zone that Nature has built a laboratory.

Just look at the surf tearing and pounding on the armor-plated beach, and the anchored vessels rolling as if they were at sea. Large pelicans sport on the nearest rocks above the surge, whilst our domestic sea-lion bobs up and down in his "west coast" paradise, for these mammals are protected by law and their food is never scarce. They are the harbor scavengers, and whilst they catch their prey below the water, they show off the swallowing part by coming to the surface and biting the huge mackerel in two.

Everything in Caleta Buena revolved round the mining magnates. The few hundred inhabitants were mine employees, both in the lower and upper villages. A very steep cable railway joined the two places, and to those of the crew who had a chance to go up in the saltpetre truck, the scene from Alto Caleta Buena was superb. Looking down on the anchored vessels, which appeared to have shrunk to the size of barges, and noting the silver patches of surf against the blue of the deep ocean, were features of the panorama. Reefs on the bed of the sea that could not be detected from the ships or boats that floated over them were conspicuous from the brow of the cliffs, and I might bring to the reader's mind that such phenomena had been greatly in evidence in the great war in helping our brave aviators to scent the U-boats from the air.

The "Maggie Dorrit" loaded and sailed for France in due time, and now that the readers of MARINE ENGINEERING have become acquainted with the ins and outs of wind-jammer life, the writer will leave them to their everyday environment—that of the steam-driven turbine vessel or the modern tramp steamer. The evening of the sailing ship is the morning of mechanical propulsion.

MUIR BROS.' DRY DOCK COMPANY

At the last lock of the Welland Canal, giving access to Lake Ontario, is situated one of the old landmarks of Great Lakes navigation.

Founded nearly seventy years ago by the Muir family, it has continued in successful operation ever since, and is going as strong as ever. An arrangement has been entered into recently with the Montreal Transportation Company, under which the two companies will be closely associated to their mutual benefit.

The Montreal Transportation Company will manage the dock under their name, and all the steamers of their fleet that can be handled by the dry dock will be taken there for repairs. The dock will also be available as in the past for any vessel requiring repairs, and facilities will be greater than in the past.

This dry dock and shipyard at Port Dalhousie was started by the Muir family nearly seventy years ago, and they have continued the business without interruption or failure for this considerable period. The original founders were five brothers, Alexander, William, Bryce, David and Archibald, and were all well known to the marine men of early days. On their death the property was left to the next generation, and the children and grandchildren of William Muir are now the owners. It has been said that all other dry docks in existence on the Great Lakes, when the Muir dry dock was started, have either since failed or gone out of existence, which gives to the Muir Dock an enviable record, and is an example of what good personal management will do.

It was in this dock that the "Chicora," one of the oldest ships in existence on the lakes, was put together after being cut in two in Buffalo for her voyage through the canal. There was a difficulty, in that the length of the lock was not sufficient to accommodate the steamer when joined together, and this was overcome in a very ingenious way.

It being known that the canal was to be emptied for repairs, the idea was conceived of utilizing the canal itself as the lock, and this was done. The gate was left off the dock, and as the canal was drained, the dock also lowered till the Chicora was lying in a dry dock extending from Port Dalhousie to St. Catharines.

The dock is so situated that it can be either pumped out or drained out. The length of the dock is 250 ft., with a depth of 11 ft. 6 ins. over the blocks. It is equipped with compressed air and oxy-acetylene welding outfit, and is now being fitted up with the necessary machinery for repairing steel vessels.

There is at present in the dock the wooden freighter, "Windsor," of 1,965 tons d.w., and she bears the distinction of being the largest vessel put into the dock up to the present date. She is undergoing repairs to her hull and equipment so extensive as to amount to practically rebuilding, and she furnishes a good example of the type of work this plant can undertake.

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

THE BLOMQUIST-ECK HORIZONTAL BORING MILL

IN designing the Blomquist-Eck horizontal boring, drilling and milling machine, the Blomquist-Eck Machine Co., Cleveland, Ohio, constantly bore in mind the working efficiency demanded of a tool of this type in practically all lines of manufacture. Realizing that it was impossible to do heavy accurate boring and milling on a low, shallow bed or base with large openings both front and rear and directly under the column where the greatest stresses and strains exist, they originated a deep bed or base of a box pattern and eliminated an inherent fault.

The working efficiency of any horizontal mill and drill depends entirely upon its ability to operate upon all classes of work at the highest speeds and coarsest feeds practicable and at all times to produce a finished product of dependable accuracy. These points have been developed to the highest degree by combining rigidity, accuracy, a suitable range of selective speeds and feeds with the highest standard of material and workmanship.

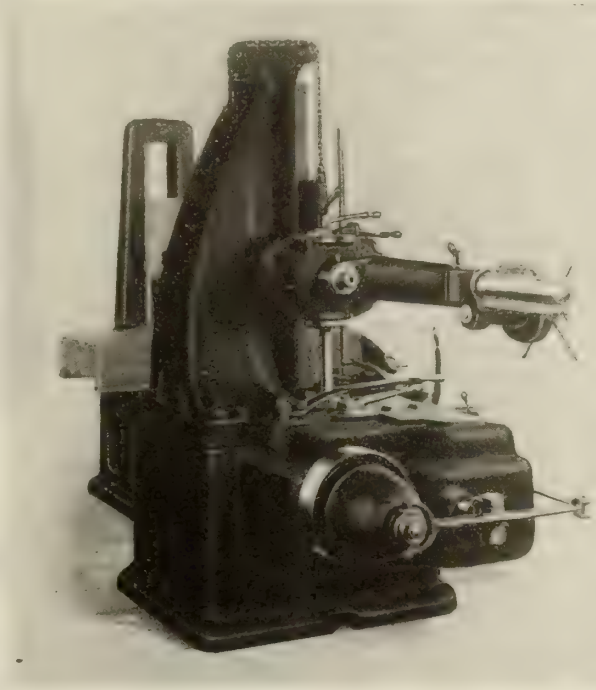
A complete system of jigs, fixtures and gauges are used, insuring a uniform standard construction throughout as well as the interchangeability of parts. The various groups of mechanism form complete individual units, and any unit can be inspected, removed or replaced without disturbing the alignment or any adjoining unit.

The bed or base is an unusually wide and deep box section cast entirely in one piece. The outer walls directly under the column are left intact without cored openings which adds greatly in resisting the lines of stress. Chip chutes are provided and so arranged that their walls give added strength. The bed (directly under the column) is reinforced by sections tied together and cast integral with the base. The bed is further reinforced by heavy deep ribs running lengthwise, and at right angles the three point support or bearing is also incorporated in the construction, forming the best known foundation principle.

The column is very rigid box section in design, strongly braced internally by ribs in both horizontal and vertical positions. The tapered sides and base of the column give the machine a neat, substantial, rugged appearance, also providing a liberal bearing upon the bed, eliminating deflections and spring.

The spindle saddle is designed with a liberal bearing surface on the face of the column, a long, narrow guiding edge with single screw adjustable taper gib for adjustments on one side and square lock form with gib on the other side. This construction will always maintain and insure a perfect alignment for the spindle saddle. The centre of the spindle in the spindle saddle is placed close to the column face (reducing overhang to a minimum) without sacrificing strength at a point most desired. The elevating screw, which is between the column faces and the spindle, is placed in such a predetermined position in relation to the narrow guide that the vertical movement of the saddle is direct and accurate. The units comprising the spindle and saddle are counterbalanced by a weight within the column, thus relieving the elevating screw of wear and tension.

Spindle is made from carefully selected high carbon steel, heat treated, ground its entire length, bored Morse taper and provided with end thrust for operating in either direction. Spindle sleeve consists of a hammered high carbon steel forging accurately ground inside and out, thereby insuring a perfect uniform spindle bearing. The front and rear spindle sleeve bearings are adjustable and tapered, made of genuine Government bronze. Either bearing can be adjusted to compensate for wear. Sight feed oil cups provide an adequate lubrication.



END VIEW OF BORING MILL

The boring bar support is raised or lowered in unison with the spindle saddle by a shaft and a set of planed steel bevel gears. The bar support or bearing proper is securely clamped by a lever binding bolt at any desired position.

The spindle is powerfully designed and well adapted to the heaviest and finest class of work. The close coupled drive gear shafts, mounted on S K F double row self-aligning ball bearings, transmit the power to the spindle in a most direct and practical manner. All shafts are made of high carbon steel. Hardened steel ring spur gears, heat treated, are used wherever possible and these are shrunk on to cast iron hubs. The smaller spur gears in the drive are made of solid steel and heat treated. The bevel gears are made of hammered steel forgings planed from the solid. The speed changes are made by two levers at the front of the machine which operate the selective sliding gears. The base is proportioned in such a manner to properly locate the entire driving mechanism and each individual shaft and bearing can be removed or replaced without disturbing any adjoining unit. Access to the entire unit may be had through an oil-tight top plate cover, the removal of which permits an easy inspection when required. All gears run in a bath of oil, and in addition a positive cascade oiling system is provided for both gears and bearings.

The feed to the spindle in either direction to the spindle saddle in raising or lowering upon the column, to the table saddle paralleling the bed, or to the table longitudinally upon its saddle, is introduced in the same direct positive geared manner as applied to the spindle drive. Shafts are made of high carbon steel mounted on S K F ball bearings. Gears are of steel and heat treated. The feed mechanism in the base is arranged so any unit may be removed or replaced without disturbing any adjoining unit. All gears run in a bath of oil and in addition a positive cascade oiling system is provided for bearings and shafts. The feed changes are made by two levers which are placed directly in front and at the top of the gear box. In addition there are three selective interlocking levers provided that engage either the spindle, vertical or table feeds. If the spindle feed is being operated, the table and vertical feeds are automatically locked or vice versa. No two conflicting feeds can be engaged at the same time. In operating star feed facing heads or work of similar nature all feed levers can be positively locked in a neutral position.

Convenience and safety is provided for the operator by placing all controlling



BLOOMQUIST-ECK BORING MILL, FRONT VIEW

levers to the front and high enough so he has no occasion to stoop or reach beyond that of his normal working position.

The bed surfaces were designed and so proportioned as to enable the use of a long, deep, rugged saddle to compensate for any overhang of the table at the extreme front or rear positions. When the table is in either extreme position it is supported in the saddle practically three-fourths of its entire length. The saddle is gibbed to the bed by the square lock method having a long narrow guiding edge with a taper gib for adjustment. Perfect alignment is always assured. The table is of an improved extra heavy pattern, long, wide and deep. It is reinforced by heavy ribs, and the metal being of a special analysis is so disposed to resist the greatest strain that might be imposed. The T slots are planed from the solid. The table is securely gibbed by the square lock method which in this instance reinforces and resists any strains when the table is in an overhanging position.

Power rapid traverse of a friction type is provided for all members operated by the feed. Regardless of whatever feed may be engaged the rapid traverse always operates at one rate of speed in either direction. It is instantly engaged or disengaged without disturbing the original feed setting. An adjustable safety friction leather washer in the clutch mechanism prohibits damaging any portion of the mechanism engaged. The clutch control is sensitive and practically any amount of travel can be had.

Adjustments by hand to the spindle saddle, spindle travel or movement, table saddle or table are provided in addition to the automatic feeds. All screws being fitted with graduated dials reading in thousandths of an inch, interchangeable work is assured and accuracy throughout obtained.

Single friction clutch pulley drive operating at constant speed is regularly furnished. Constant speed or adjustable speed motor drive is furnished when required at extra prices. The manufacturers are prepared to equip their machines with any type of electrical control, manual or automatic push button.

HYDRAULIC PLATE TIGHTENER

The McBride hydraulic patented plate tightener, fills a long felt want, a wonderful machine capable of exerting a pressure of 20 tons upon a steel plate so that it can be bolted into place. The invention is probably the most important one for speeding up shipbuilding since the riveting gun was perfected—which is demonstrated by the fact that all the larger shipyards on the Pacific Coast have adopted it, while builders from all parts are ordering in large quantities.

The plate tightener is but twenty-two inches over all and weighs only fifty-eight pounds. It is portable, handles easily and is operated by one man, assisted by a helper working on the side of the plate opposite to him.

The shell and piston rod of the machine are made of chrome nickel and the piston of tool steel. The triple expansion hydraulic pump is of manganese bronze.

The plates to be bolted up are placed between two compensating nuts of the plate tightener, the piston rod, taking the place of a bolt used in the hand method of tightening, is slipped through the proper holes punched in either plate, the lever is worked by hand and forces oil down on the piston rod in the chamber or shell until a pressure of twenty tons is exerted in drawing the plates together. When the plates are drawn together by hand, not all of the spring is ever entirely taken out of them. The plate tightener absolutely takes out all spring in the plates and has proven it countless numbers of times in actual demonstration.

Once the plates are drawn together tightly, bolts are slipped through the holes on either side of the piston rod and screwed up. The machine is then moved over different holes and the process repeated.

In the hand method, repeated changes in lengths of bolts have been required, considerable delay being entailed in putting on washers to take up the added space from time to time. With this machine but one length of bolt is required, a great saving in time and expensive materials thereby resulting.

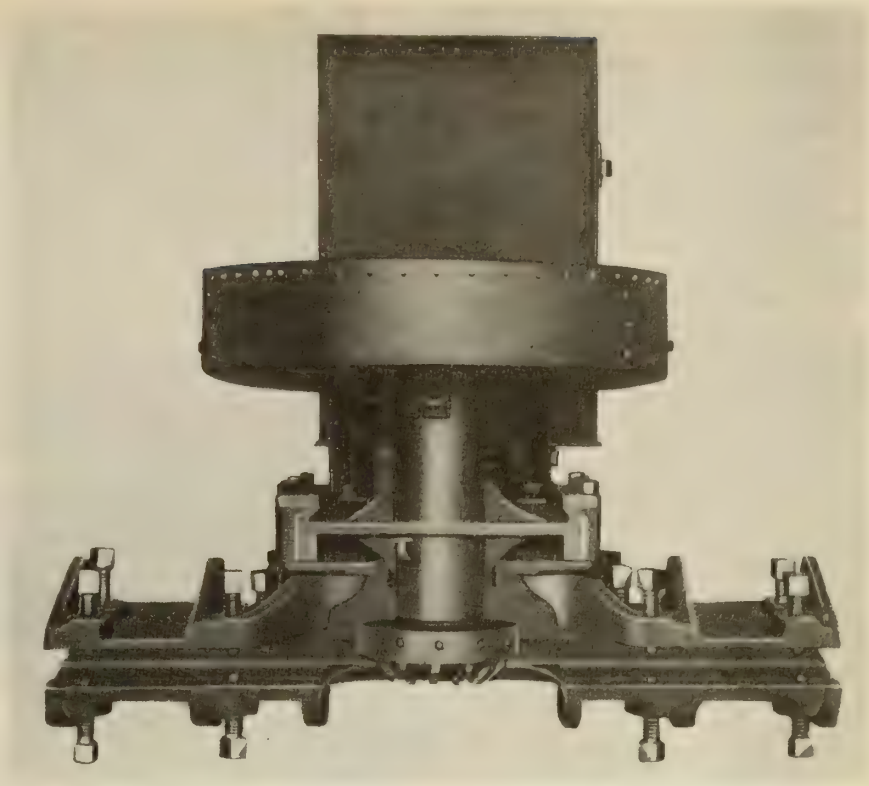
The machines have been subjected to the severest of tests in the yards of the



HYDRAULIC PLATE TIGHTENER

Skinner and Eddy Corporation and won out promptly on merit. The demonstrations in these yards showed that one man and helper with the machine performed work formerly requiring twenty men. The Todd Dry Dock & Construction Corporation, of Tacoma, promptly adopted the new invention, which was only called to the attention of the Shipping Board officials during the visit of the Schwab party to Seattle. Since then every steel yard on the Pacific Coast which has heard of it, has ordered it. It does not promise to revolutionize bolting up, it has already done so at Skinner and Eddy's, where they have been setting world's records in shipbuilding for many months.

After Charles A. Piez, vice-president of the Emergency Fleet Corporation, watched the machine in action during his visit to Seattle, he stated that its performance was nothing short of marvellous, considering its size, weight, simplicity, speed and wonderful performance: Further, he immediately notified Capt. John F. Blain, the district officer of the Emergency Fleet Corporation, that the inventor, Mr. McBride, was to be given priority on any materials he required in the manufacture of the machines.



FRONT VIEW, SHOWING CUTTER HEAD.

SKINNER AND EDDY SCARPHING MACHINE

Heretofore the usual method of scarphing ship plates has been by means of air-driven chipping tools, with which the desired recesses are cut in the plate—a tedious and expensive procedure, resulting in work which is far from being accurate.

The time required for a skilled workman to chip an average scarph in the plating for a ship by this method is about one hour and fifteen minutes. With the scarphing machine illustrated, it is possible to cut a similar scarph in ten to fifteen minutes, or, allowing ten minutes additional for changing and resetting the machine, a complete, clean, accurately machined scarph may be completed every twenty or twenty-five minutes.

This New Invention

Will cut a smooth, accurate scarph in 10 minutes. Is portable, handled over plate by kid crane and trolley, reducing operations to a minimum.

Is light in weight, speedily operated by electric motor. Will cut at any angle a scarph of any length up to 16 inches and any width up to 8 inches.

Is readily adjustable to any thickness of plate.

Has been adopted by more than thirty of the leading shipbuilders of the country.

Machine is driven by a 3-horse-power, 1,200 R.P.M. motor of either direct or alternating current. Motor furnished by customer.

Cubic measurement 33.20 feet. Weight, 1,000 pounds.



NEW SCRAPHING MACHINE.

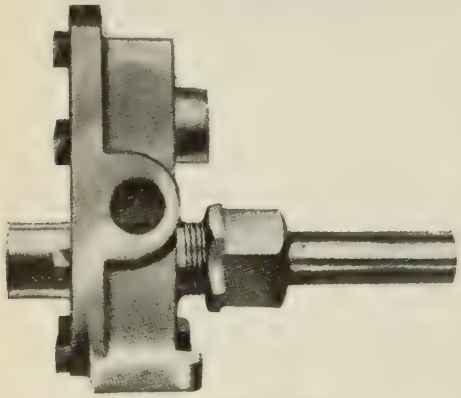
BRONZE GEARED PUMPS

The Bronze Geared Pumps, manufactured by the Oberdorfer Brass Co., Syracuse, N.Y., are admirably adapted to the handling of small quantities of liquids, which have to be moved in a steady and reliable manner. They find considerable use in connection with the water and oil circulation on gas engines, and are found in homes for supplying water, in factories for pumping water, lubricating and fuel oils; in various industries for pumping vinegar, wines, spirits, etc.

These pumps are simple and durable in construction and consist of the smallest possible number of moving parts. The housing and gears are cast of bronze perfectly adapted to the purpose. Tobin bronze is used in all shafts in place of steel. Brass screws are used for securing the cover plate through the body so that there will be no rusting or corrosion. All parts are carefully machined and are perfectly interchangeable. The impeller shafts are provided with a

packing gland secured by a lock nut. Every pump is tested before being placed in stock. None pass inspection unless they show the proper pressure on discharge, and must raise water three feet without priming. Various types and sizes of these pumps are made so that any possible condition which will likely be met with may be supplied out of stock.

In many installations in which is required a varying quantity of liquid under a constant pressure as the pumping fuel oil to several burners or a constant quantity of liquid under a variable pressure as forced lubrication to several bearings, an unloader or other means of relieving an excess pressure is necessary. In pumps for this work this is accomplished by the placing of an unloader in the cover plate of the pump. The inlet pipe is connected from the supply to the pump in the usual manner, and the discharge is connected from the pump to one or more points, as desired. When the pump is started and its outlets are entirely or partially closed so that the pump cannot deliver liquid equal to its



BRONZE GEAR PUMP

capacity, a pressure is built up in the line from the pump to the point of discharge. The pump, however, is provided with a relief valve or unloader, which can be set for any pressure desired in this line, and when the pressure exceeds the amount the surplus liquid is then bypassed and circulates within the pump itself. The pressure on the discharge line is, therefore, constant for any discharge from nothing up to the capacity of the pump. No return pipe is required to take the surplus back to the supply tank.

THE SHIPBUILDING AUTO-CRANE

By FRANK C. PERKINS

The accompanying illustration shows a modern Auto-Crane at work in shipyard service, developed at Ravenna, Ohio.

It will be seen that this shipbuilding auto-crane is a small, self-propelling crane to be used as an auxiliary in large shipyards for car unloading and material rehandling. It was designed for the smaller shipyards building wooden ships,



AUTO SHIP CRANE.

This crane is worked efficiently between the ways, as shown in the accompanying photograph. The crane is self-propelling, with two-way traction and one man control.

This Shipbuilding Auto-Crane is easily changed to accommodate a clam-shell or orange-peel bucket for excavating work or for rehandling loose material, by changing the boom or in some cases by merely adding a cable. These cranes are equipped with two or three drums, or a third drum can be added in the field.

There has been developed a Steam Driven Rail Truck Crane, with special heavily reinforced 40-ft. boom, especially adapted to smaller shipbuilding plants as a building crane, or for use in larger plants as an auxiliary rehandling crane.

It has often been found desirable to equip the auto-cranes for steam, electric or gasoline power, to run on roadwheels or railtrucks.

The shipbuilding auto-crane has a length of car body of 17 ft., 10 in., the width of car body being 6 ft., 6 in., and the width outside wheels being 10-ft. The capacity when used as a derrick is 4,500 pounds, at 20-ft. radius and the weight of the road wheel crane is 11 tons, the weight of the railtruck crane being 14 tons.

The propelling speed is 200 ft. per minute and the power is supplied by a locomotive crane type engine, developing 25 H.P. by brake test at 100-lb. steam. In many instances a gasoline, 30 H.P. engine of the 4 cylinder type is used. The vertical traction motor can be run on kerosene. The trucks have road wheels with 3 point suspension and steel driving wheels, 36 in. dia., and 14 in. wide, with steering wheels 30-in. dia. and 12-in. wide. The crane is provided with a 2-wheel rigid truck at the front end and a 4-wheel swivel truck at rear, the machine being equipped with a steel cab indicated in the illustration.

SPACE NOW FOR PRIVATE SHIPPERS

An indication of the changed conditions resulting from the cessation of hostilities is noted in December operation of regular steamship lines. Previous to this month all cargo space in transatlantic vessels was appropriated for transportation of Government requirements, under the British Ministry of Shipping. From the beginning of December, ten per cent. of space has been set apart for private shipments, and while this is available for any and all materials, it is the intention to reserve it, as far as possible, for materials used in reconstruction. Shipments of private foodstuffs still require a license, as it is not considered advisable that private operations should conflict with those of the Government in this particular.

Steel shipyards are being better supplied with plates for current operations, but have recently experienced some difficulty in this connection. Halifax yards were considerably handicapped in this respect. The harbor of Halifax, which, during the war, has been under the jurisdiction of naval authorities, has again reverted to civic control, and the administration is again handed over to the harbor master, Capt. F. G. Rudolf. Some new regulations will still obtain, but the gates are being removed and the harbor is now open to the commerce of the world.

At a recent inspection of the Halifax terminals of the C.N.R., made by D. B. Hanna and the directors, it was announced that eventually the Government would operate a fleet of at least fifty ships, these being put into service as fast as they are completed. In connection with the development of the port of St. John, N.B., it was said that a comprehensive scheme of harbor expansion would soon be proceeded with to increase the general efficiency of harbor operation.

Notes on Regulations for Arc Welding

In a Paper Read Before the I.E.E. the Author Points Out a Number of the Precautions to be Observed in Arc Welding For the Safety of the Operator and the Effects of a Welding Load on the Supply Mains of the Power Station

By H. M. SAYERS.

ELECTRIC arc welding has recently come into use for a variety of purposes and shows promise of extensive developments. The practice at present is mainly empirical. In view of the possibilities of its application to shipbuilding, one of the Admiralty Departments has set up an Electric Welding Research Committee, including a number of unofficial members representing important interests who offered to render voluntary assistance in the development of electric welding.

One of the points which has come before the Committee is the question of establishing rules in respect of (a) safety of operators, (b) conditions of supply; and it has been thought essential to have a discussion in order to get the views of members of the Institution on these matters.

A very large and influential Research Committee has been formed in the United States. It is communicating all its proceedings and reports to the Admiralty Committee, and among them the discussions and reports on regulations.

The Admiralty Committee has already drawn up a skeleton form of regulations based on experience in Great Britain and the communications from the United States, which are set out below.

This paper is therefore brought forward to introduce a discussion, and to set out the points as they at present appear to arise in practice in Great Britain.

Welding Regulations

It may be said that arc welding has been in use for over 20 years, but its extension to heavy work and the use of metallic electrodes are of more recent date.

Necessary regulations are conveniently divided into two heads:—

(1) Regulations affecting the safety of operators and workers in their vicinity.

(2) Regulations affecting the reliability and regulations of general supply systems.

Taking the first heading, there are two main points:—

(a) Protection of operators and neighboring workers from the effect of the radiations from the arc.

(b) Protection from shock.

(a) Protection from radiation.—Under the first heading it is well known that the light from a naked arc has a serious effect upon the eyes and the skin. This is more serious with the iron arc than with the carbon, as the iron-arc radiation is richer in rays of short wavelength, including ultra-violet rays, which are specially detrimental. Welding arcs require large currents, e.g. a No. 10 welding rod requires up to 120 amperes, and as the extension of the arc to heavier work is clearly foreshadowed, arcs carrying several hundred amperes have to be reckoned with in considering protective appliances.

Where welding is carried out in a factory under stationary conditions the provision of screens, masks, etc., for the welders can be readily arranged, and each operator's position can be isolated from neighboring workers by suitable screens.

More difficulty arises in such work as welding the hulls of ships, where the welders must work on stages; and most, perhaps, in repair work, such as is carried on in marine and other boilers, ship spaces, etc.

The object to be attained in every case is, however, that arc radiations shall not reach the eyes or skin of either the operators or persons in the vicinity, except through screens which obstruct the injurious rays.

The welder himself and any assistant must be able to see his work, and it is therefore necessary that such screens as they use shall be reasonably transparent to ordinary light. It has to be remembered that the skin of the hands, arms, face, and neck needs protection. This can be given by any opaque material. Glass can be obtained which is practically opaque to the most injurious rays, and yet fairly transparent to ordinary light. Combinations of colored glasses are also in use, which are fairly satisfactory. The U.S. Research Committee has recommended certain combinations of this kind.

It is clearly important that the screen or mask used shall be such as not to restrict the operator's movements or to cause a discomfort. Goggles protect the eyes only. Masks are in use which protect the face as well, but masks are open to objection on the point of comfort. A screen held in the left hand carrying a sufficient area of suitable glass, and on apron to shield the left arm, are satisfactory for stationary work. It may not prove so good for ship-building and repair work where the left hand may be required for other uses.

There is no doubt a danger radius from an arc of given power, beyond which no screening is necessary in respect of eye and skin protection. But intense lights within the usual field of vision are objectionable in any working space, quite apart from directly injurious effects, so that the screening-off of welders in factories seems desirable in any case. In shipbuilding it is probable that whilst welding is in progress on any section all the near-by workers will be welders and their mates who will have their individual protection.

In repair work, especially in ship spaces, exigencies of time may require other workers to be employed close to the welders, and perhaps the only possible regulation would have to be in the general terms that efficient shielding from the arc must be employed in such cases.

It may be said that whilst the short-length waves are responsible for the damage to the eyes, and some of that to the skin, the long-wave or heat radiations from powerful arcs also produce sunburn effects on the skin, which must be guarded against. This effect is, however, essentially of short range and mainly affects the welders themselves.

(b) Protection from shock.—The pressure across a welding arc is quite low. Both for direct and alternating-current arcs it is of the order of 25 to 30 volts. But there is always a steadying resistance or choker in series, and when the arc is broken there is the full supply of pressure on the electrode. It is at this time that there is more danger of shock both because of the higher pressure and because the electrode is not visibly dangerous. It may be laid on the bench or any other handy place and inadvertently touched.

It has to be remembered that in working from a stage, etc., the danger of shock is from indirect effects such as those causing a start or stumble, loss of balance. With d.c. arcs there need be no danger if the supply conditions are properly adjusted; 100 volts is the maximum supply pressure necessary either for carbon or for metallic electrodes, including steadying resistances, and 100 volts d.c. will not make a man start or stumble. Therefore, as regards direct-current welding, the maximum voltage needed is below the danger point, and it is only necessary to limit the supply pressure to some such figure as 100 volts. Even 200 volts (which it may be convenient to employ where welding is only done occasionally) can hardly be called dangerous.

In the case of alternating-current welding the conditions are rather different; whilst the actual arc voltage as

shown by a voltmeter is quite low, 30-35 volts, practice shows that a considerably greater circuit voltage must be available. One manufacturer puts this at 110 volts. The minimum stated by another is 65 volts. This matter is under special investigation, and it need only be said here by way of explanation that an iron arc distorts the E.M.F. wave, giving a sharp rise at the beginning of each alteration. Presumably the supply wave must be able to give this peak much in advance of its own peak. It must meantime be accepted that at least 65 volts is needed for a.c. welding. This pressure is capable under certain conditions of giving a severe shock. A welder is certain to have his skin damp with perspiration, which is one condition favorable to a shock. Therefore, to touch a live electrode may have serious consequences, especially for a man working on a staging.

A welder will normally wear a protecting gauntlet of leather, so that there is little risk of shock through the hands unless working in conditions leading to wetting of the gloves. It may perhaps be necessary to lay down the rule that for a.c. welding the gloves must be waterproof. The most likely chance of getting shocks seems to be when the electrode is laid aside and the welder has his hands bare. It is suggested that this danger can be averted by a "no current" circuit breaker in the circuit, which could be cut out by a pedal switch for the purpose of re-starting the arc. This "no current" breaker would serve another useful purpose in preventing the use of too long an arc, which makes bad work.

It is submitted that both for a.c. and d.c. welding the work should always be earthed, or connected to the earthed pole of the supply circuit.

It should be a rule that a proper hook or receptacle should be always provided for an electrode not in actual use, and should always be used. This guards against shock, burning, and unintentional short-circuits by contact with the work, and is as essential for work under temporary conditions, repairs, etc., as in a factory. Possibly this rule might dispense with the "no current" breaker in a.c. work. The flexible lead to the electrode needs a little consideration. It must necessarily be somewhat heavy in copper section. The insulating covering must be strong and flexible. Armouring is scarcely admissible on account of weight and stiffness. It should be readily detached from the connecting socket, for ease of exchange, and there should be a switch or breaker between the supply and socket.

The insulation of the flexible near the electrode holder is exposed to considerable heat, conducted and radiated. It must not be damaged by this heating.

The steadying resistances require just the same precautions as resistances for arc lamps, starting and regulating resistances, but as the currents are heavy and pass during the whole of the welding operation ventilation must be good. These resistances, chokers, etc., must be capable of carrying the short-circuit current without rising to a dangerous or destructive temperature. The design presents more difficulty in portable equipments for repair work, etc., than for stationary equipments. The matter only concerns safety regulations in respect to fire risk and accidental contact, and the same regulations as for other similar operations should suffice.

Supply Regulations

The conditions of welding are not favorable for direct supply from the mains of a supply undertaking. The maximum voltage needed, say, 100 volts a.c., down to 60 volts d.c., is considerably below most supplies. The condition that the work must be earthed is also objectionable from the point of view of a supply authority. Of course a higher supply voltage may be used by the simple expedient of using a larger resistance in the welding circuit, but this is wasteful and increases shock dangers. On the grounds of economy it is not likely to be used where welding is in constant or frequent use. The temptation to use it is strongest in works where welding is only done occasionally.

The cases of a.c. and d.c. supply differ materially. Where the general supply from the mains is direct-current it must be expected that the pressure will be 200 volts or over from each outer main to earth. This is much higher than needed, and it brings in a distinct danger of shock, besides being wasteful of energy. It can therefore be excluded from consideration for equipment in steady use. It will pay the user to put in a converting set yielding the desired voltage.

The case of occasional welding may need consideration. From the economical point of view it may pay the user to throw away 75 per cent. of the energy in resistance rather than incur the cost of a converting set. In such cases the safety arrangements must be similar to those provided for a.c. sets. The supply interests, it may be suggested, will be sufficiently protected by proving that the current taken shall be limited in the same way as to any other power circuit. It seems obvious that welding supply-circuits must be run separately from any others from the consumer's main fuses. It should be arranged that the work connection can only be made to the earthed lead of the supply. But it must be expected that the work will be earthed in many cases, and it is suggested that supply engineers should tolerate this with such reservations as to power to disconnect for testing purposes, etc., as they think necessary to protect their systems. The Board of Trade regulations will need an exception to be made in the same sense.

Where, as in most cases, motor-generators are used for supplying d.c. welding sets, the supply mains have better protection, the generators can have characteristics desirable for welding circuits, and the polarity of the electrode can be reversed for special work when desired.

Alternating-Current Welding

Owing to the cheapness and efficiency of transformers, it may be assumed that these will always be used between the mains and the welding circuit. From safety considerations alone these should be of the two-circuit type and have earth shields.

Where single-phase is given, the supply undertaking hardly needs special protection, excepting those common to other power uses. It may perhaps be thought advisable to require that part of the resistance in the electrode circuit shall be in the form of choking coils to limit the current on striking the arc, and on making accidental contacts between electrode and work which are virtually short-circuits.

Where the supply is given from a multiphase system, questions of balancing arise. Obviously the simplest connection is to put the welding transformer across one phase. If a number of welders are in use and they are equally divided between the phases, they will approximately balance each other.

A single-phase supply can be obtained from either two-phase or three-phase systems, loading each phasing. With two-phase three-wire distribution a single-phase supply can be obtained from the two outers, giving 1.414 times the voltage of either phase. This can be transformed in a single-phase transformer to the welding pressure. Whilst this connection loads each phase equally as regards current, the resultant current is out of phase, lagging on one side and leading on the other, reducing the power factor and tending to unbalance the voltage on the two phases.

Alternatively single-phase current can be taken from each phase directly, and where a number of welders are in use this is the simplest and most satisfactory connection, the welders being equally divided between the phases. There is, of course, the probability that unequal numbers will be in simultaneous use on the two phases, producing some unbalanced load.

With three-phase distribution single-phase current can be taken from a three-phase transformer with its secondaries connected in a particular way. This connection gives currents largely out of phase in opposite senses in two of the windings, tending to unbalance the voltage and reducing the power factor.

Welders can obviously be fed from the separate phases, and if a fair number are distributed between the phases the resulting out-of-balance loads will be only those due to differences in the numbers in simultaneous use.

The whole question from the supply point of view is one of magnitude of the effect, having regard to the relative proportions of the welding load and the general load supplied by the power or substation affected. The provision of condensers or other corrective devices on

the lagging-current phase may be worth while in large lay-outs.

At the present stage it seems premature to make definite regulations. Supply undertakers would be sufficiently protected by the provision that for welding plants above a certain capacity, varying with local conditions, the method of converting the supply shall be subject to their approval, which shall not be unreasonably withheld.

In both d.c. and a.c. welding the striking of the arc is potentially the short-circuiting of the leads. It is on a par with the starting up of a motor, but somewhat more favorable, inasmuch as when welding there must be a resistance in circuit and the current can be limited by providing some minimum resistance or choker which the operator's regulating switch does not cut out. Similar regulations to those limiting starting currents on motors will therefore suffice, with the simplification that where a number of welders are in use a single limiting device in the mains is all that is necessary to protect the supply.

A THREAD-MILLING MACHINE

It is a recognized fact that thread milling has come to the front during the last four years as never before, adaptation of this principle of threading small parts, that must be accurate, is now generally accepted the best practice. Particular attention to thread millers suitable for shells and shell parts has been given more attention than any other line of manufacture. A distinct improvement has been made both in design and operation with a view to more rapid production, and the adaptation of a machine to almost any article that could be securely held.

The Westman Machine Co., of London, Ont., have designed a machine embodying the above features, and whilst the same is tooled for threading 155 mm. adapters, it can be fitted with chucking arrangement, and cut off for threading pipe up to 2½ in. This method of threading pipe makes a superior thread, and is much quicker than die threading, and costs less in die upkeep. Machine is supplied with the necessary chucking device depending upon the nature of the work to be held.

Another important feature is the means adopted for operating on different number of threads. This can be done by changing the lead nut and hob which makes the machine capable of covering a greater variety of articles both as to the number of threads and diameter of article to be threaded. The machine is semi-automatic. After the article to be threaded has been secured, the cutter is brought in contact with a lever working on toggle joint, which is adjustable to varying diameters, and to fine limits. The feed is then set in motion, and after making revolutions, automatically stops, the cutter is thrown back, giving ample space for the release of the work.

The machine weighs, approximately, 800 pounds, and can be fitted with air chucks if desired.

THE PAST SEASON

ocean terminals. The official closing of the port of Montreal a short time ago brought to a close a season marked with peculiar characteristics under the restrictions of war operations. Due in no small measure to the foresighted policy of the Harbor Commissioners, the port, during the past five or six years, has been placed in an excellent position to handle the heavy war business of the past four years. The close co-ordination of the shipping and railroad organizations, together with the splendid facilities for loading and unloading vessels, has resulted in this work being carried on expeditiously and with great efficiency. The past season has seen practically no passenger movement from the port, as the operations were virtually confined to the movement of troops and war supplies, many of the local sheds being under the direct supervision of the British Ministry of Shipping. The wharves this year have been a regular bee-hive for the transportation of Canadian food and other products, a factor that will have an indirect bearing on the future reciprocation from overseas countries.

American Flag In Evidence

A feature that has been especially pronounced during the past navigation season is the large number of vessels flying the American flag that have been brought down the canals for overseas service. Many of these, too long for the locks, were brought down in two sections and put together here. About the end of November the Naval Department at Ottawa cancelled the regulations, which have been in force during the war period, forbidding the clearance of sailing vessels for the danger zone. The general censorship that has been maintained was also lifted, so that shipping operations and ship movements could be given publicity; but while the close secrecy, which has been a feature of the port for the past three years was slightly lifted, the general operations in and about the harbor continued under the veil, owing to the fact that no official announcement to the contrary had been received by the commissioners. The usual harbor guards were maintained up to the closing date of the port.

The Epidemic Well Cared For

Another condition that has been instrumental in maintaining efficient operations at the harbor was the practical method adopted by the various officials in handling the epidemic of the past few months. The prompt action of the commissioners prevented a tying up of the port at a time when such a policy would have been detrimental to the cause of the Allies. Within 24 hours of the decision of the officials, the Catholic Sailors' Club was converted into an emergency hospital, thoroughly equipped to handle all the cases then reported, or likely to develop, and it is due to the prompt action taken that the port was saved from the fate of being placed in quarantine.

ADMIRALTY COURT REPORTS

SS. "SOMALI."

In the matter of a formal investigation conducted at Quebec, October 17th, on board the SS. "Somali" and presided over by Captain L. A. Demers, Dominion Wreck Commissioner, assisted by Captain Chas. Koenig and Captain G. Houlgrave, into causes responsible for a fire which declared itself in Hold No. One of the said vessel and which, although ultimately extinguished after flooding the hold for twenty-seven hours, caused damage by fire and water to the cargo, the following evidence was adduced:

The Master, Geo. Lanphier, set forth that he is the holder of Certificate Number 026412, and that the SS. "Somali" which is the property of the Peninsular Quental Company, is a steel built vessel having a gross tonnage of 5,712 and a net tonnage of 4,193 and bears the Official Number of 114,056. That she is 465 feet long and 55 feet wide, with a draft of twenty-seven feet loaded and sixteen feet light, that she is equipped with twin screw triple expansion engines and carries a crew of 169 men, including four certificated deck officers and six qualified Engineers.

That the said vessel having effected a crossing from Archangel to Montreal with a cargo of flax, had the lower holds duly reloaded with general cargo and sailed for a British port on October 5th.

That while anchored off Quebec the Chief Officer perceived smoke issuing from the starboard ventilator and that he, the Master, having been forthwith notified of this ominous indication of fire, immediately ordered all available equipment to be requisitioned to combat the menace.

That the origin of the fire having been traced to Number One hold, the men were ordered below to shift cargo in the hope of locating it, but their efforts proving inadequate to its ever increasing intensity, a wireless was despatched to H.M.S. "Donegal" requesting additional help, in response to which thirty men were immediately ordered to the "Somali," but the fire had by now assumed such menacing proportions and being inaccessible among the cargo, even by most strenuous combined effort proving ineffective, the only alternative was then resorted to, and the hold was flooded, but it was not until 10.30 the following night that the fire was finally declared extinguished.

Alexander Morton, Chief Officer, declared that he is the holder of a Master's Certificate bearing number 2,176 issued at Bombay, and that upon first perceiving the smoke he emptied the contents of three fire extinguishers down the starboard ventilator, following which he issued the requisite orders and superintended the various phases of the strenuous work which ensued. He was the responsible disciplinary officer, and upon observing that workers engaged in the loading were, contrary to the regulations, smoking on deck and in the holds, he endeavored to have the pernicious practice cease by duly notifying the shore authorities. A Swede was numbered among the crew, but he, the Chief Officer, declared that he had implicit confidence in this man whom he considered as one of his most reliable and trustworthy workers.

The holds of the vessel were left unguarded but for the casual supervision of the Second Officer and the watchfulness of a Quartermaster when occasionally detailed for such duty.

William Henry Alford, the Second Officer, set forth that he also had complained of the smoking which he observed in the holds and that a foreman was thereupon delegated to admonish the miscreants who, while temporarily ceasing, resumed their smoking shortly afterwards, while the Second Officer was informed by the Superintendent to whom he had complained, that the pernicious habit could not be controlled.

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Work in Progress in Canadian Shipyards

A record of Work in Process of Completion—Principal Features of Specification—Approximate Launching Dates—Vessels on Order.

BRITISH COLUMBIA

YARROWS, LIMITED, ESQUIMALT, B.C.
One stern-wheel steamer, 165 ft. x 35 ft., for Indian Government service.
At present engaged chiefly on repair work.

H. VOLLMERS, NANAIMO, B.C.
One gasoline tug, 9 tons.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
Four wooden steamers, Nos. 10-11-12-13, for undisclosed interests. 250 ft. x 43 ft. 6 in. x 25 ft., moulded depth, 2,800 tons d. w., 1,000 h.p., single screw engines, 12 knots, naval architect, I. Alexander. Launchings March 14, April 14, May 15 and June 15, 1918.

B.C. CONSTRUCTION & ENG. CO., POPLAR ISLAND, NEW WESTMINSTER, B.C.
Four wooden vessels, 1,800 gr. tons, 2,800 tons d.w.

NEW WESTMINSTER MARINE CO., FT. OF FURNESS ST., NEW WESTMINSTER, B.C.

STAR SHIPYARD CO., NEW WESTMINSTER, B.C.

J. A. CROLL, PORT ALBERNI, B.C.

PACIFIC CONSTRUCTION CO., PORT COQUITLAM, B.C.
Taken over the plant of the Coquitlam Shipbuildiug Co.
Gasoline yacht, 50 ft., June, 1918.
Three wooden freight steamers, Nos. 20-21-22, 250 ft. b. p. x 42 ft. 6 in. x 25 ft., 1,800 gr. tons, 2,800 tons d.w., trip. exp. engines, water tube boilers ,12 knots, 1,000 h.p. Two for undisclosed interests, one for builder's account. Launchings May 20, June 15, Sept., 1918.
Four new berths under construction for steel ships up to 10,000 tons.

C. E. BAINTER, PRINCE RUPERT, B.C.
Several wooden fishing steamers, for undisclosed interests.

GRAND TRUNK DRYDOCK SHIP REPAIR CO., LTD., PRINCE RUPERT, B.C.

S. A. MOULTON, PRINCE RUPERT, B.C.
Ten composite vessels for undisclosed interests.

BRITISH-AMERICAN SHIPBUILDING & ENG. CO., VANCOUVER, B.C.
Establishing plant on Kitsilano Reserve.
Twenty wooden vessels being built for undisclosed interests, 3,500 tons each.

JOHN COUGHLAN & SONS, N. VANCOUVER, B.C.
"War Camp," sister ship to "Alaska," launched in March, 1918.
One steel freight steamer, 427 ft. 9 in. x 54 ft. x 29 ft. 9 in., draft 24 ft. 2 in., speed 11½ knots, 5,730 gross tons. Launched Jan. 10, 1918, for B. Stolt Nielsen, Christiania, Norway. Both sold to the Cunard Line.
Three steel steamers, "War Chariot," "War Chief," and "War Noble," Nos. 4-5-6, 425 ft. x 54 ft., 8,800 tons cap., for the Cunard Line.
Six steel freight steamers, 425 ft. x 54 ft. x 24 ft. 2 in., 8,800 tons cap., 1 knots, for undisclosed interests. Delivery Jan., Feb., March, May and July, 1918.
One steel freight steamer, "Alaska," 427 ft. 9 in. x 54 ft. x 29 ft. 9 in., draft 24 ft. 2 in., speed 11½ knots, 5,730 gr. tons, 8,800 d.w. Launched Jan. 10, 1918, for B. Stolt Nielsen, Christiania, Norway. Sold to the Cunard Line.

THE FOUNDATION CO., VANCOUVER, B.C.

FRASER VALLEY SHIPBUILDING CO., VANCOUVER, B.C.

GRANT, SMITH & CO., VANCOUVER, B.C.
Six wooden cargo vessels, 250 ft. x 43 ft. 6 in. x 25 ft., 3,000 tons cap., 9½ knots, for the Canadian Government.

HARRISON & LAMOND, SHIPBUILDERS, LTD., VANCOUVER, B.C.
One wooden auxiliary schooner, 225 ft. x 44 ft. x 21 ft. 4 in., 1,600 gr. tons, 2,550 tons cap., for undisclosed interests.

LYALL SHIPBUILDING CO., NORTH VANCOUVER, B.C.
"War Puget," Feb. 16, 1918, 250 ft., wood, 2,080 tons.
Ten wooden cargo ships, for undisclosed interests. Launchings Jan. 20, Mar. 2, Mar. 23, and April 11, 1918.
Building six wooden vessels for own account.
"War Caribou," April 10, 1918, 3,080tons, wood.

W. R. MANCHION, VANCOUVER, B.C.

STANDARD SHIPBUILDING CO., VANCOUVER, B.C.
Two 3,500-ton vessels for Brazilian Govt., and six for French Govt. of 4,500 tons.
Donohoe reinforced type, wood composite construction.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
Number of small vessels being constructed at total value of $300,000.
4,500-ton floating drydock, 352 ft. long.

VANCOUVER SHIPYARD, LTD., VANCOUVER. B.C.
One motor freighter, 125 ft. x 24 ft. x 12 ft., wood, 160 h.p., Bolinder's crude oil engine. To be completed Aug., for Taylor Engr. Co.
Also repairing several steamers and schooners.

THE WALLACE SHIPYARDS, LTD., N. VANCOUVER, B.C.
"War Dog," 4,500 tons, steel, May 18, 1918.
"War Power," 4,600 tons, steel, March 23, 1918.
Two steel steamers, 315 ft. x 45 ft. x 27 ft., 4,600 tons d. w., trip. exp. vertical engines ,two S. E. Scotch boilers, 10 knots, single screw, for the Canadian Government. Deliveries Dec., 1917, and Aug., 1918.
Two wooden aux. schooners, 255 ft. o. a., 225 ft. keel x 44 ft. x 21 ft. 4 in., five masts, 1,500 gr. tons, cap. 2,500 tons or 1,500,000 ft. lumber, two hatches, twin 160 h.p. Bolinders Hot-bulb engines, twin screws, for the Canadian Government.
Four wooden cargo vessels, aggregate tonnage of 17,500 tons for undisclosed interests.

CHOLBERG SHIPYARD, VICTORIA, B.C.
4 1,500-ton vessels for Norwegian purchasers. Keels laid Oct. 4th, 10th and 25th respectively.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
"Teco," 300 tons. Motor coasting freighter fitted with Bolinder 200 h.p. Built for William Mason Rooke.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
5 1,500-ton d.w. wooden vessels for the French Government, four of which are in frame. Planking and ceiling progressing in three.

NORTHERN CONSTRUCTION CO., VANCOUVER, B.C.
5 1,500-ton d.w. compound engines, 12 x 24 x 16 stroke, twin screw water tube boilers, 2,000 sq. feet heating surface. Building for French Government.

THE FOUNDATION CO. OF B.C., VICTORIA, B.C.
20 wooden ships for French Government, 3,000 tons d.w., fitted with triple expansion twin screw engines, 1,100 I.H.P. Contract to be completed in December.

WESTERN CANADA SHIPYARDS ,LTD., VANCOUVER, B.C.
"War Nootka," Jan. 4, 1918, 3,080 tons (machinery installed at Ogden Point Assembly Sheds).
Six wooden freight steamers, 250 ft. h.p., 259 ft. o. a., 43½ ft. extreme breadth, molded 42½ ft., 25 ft. molded depth., draft 22 ft., 2,800 tons d. w., for undisclosed interests. "War Nootka," launched January 4, 1918. "War Selkirk" launched March 6, 1918.
"War Tatla," "War Casco, "War Chilkat," "War Tanoo," 4 standard vessels now under construction.

CAMERON-GENOA MILLS CO., VANCOUVER, B.C.
"War Yukon," Jan. 24, 1918, 3,080 tons, wood (machinery installed at Ogden Point Assembling Sheds.

THE FOUNDATION CO. OF B. C., LTD., VICTORIA, B.C.
Building ships for undisclosed interests.
Five wooden steamers, 250 b. p. x 42 ft. 6 in. x 25 ft., 1,800 gr. tons, 2,800 tons d. w., one trip. exp. engine, 1,000 h.p., "Howden" water tube boilers, furnished and installed by owners, 10 knots, for undisclosed interests. Esplen & Son & McNaught, N.Y.C., designers.
No. 1—"War Sonchee," launched Dec. 27, 1917.
No. 2—"War Masset," launched April 11, 1918.
No. 3—"War Babine," ready for launching, awaiting propeller and rudder.
No. 4—"War Camchin," ready for launching, awaiting propeller and rudder.
No. 5—"War Nanoose," ready for launching in about five weeks.

CLARENCE HOARD, VICTORIA, B.C.
Wooden car barge for C.P.R., Jan., 1918.

VICTORIA SHIPBUILDING CO., VICTORIA, B.C.
Constructing wooden ships for British Govt., 3,500 tons each.

NEW BRUNSWICK

C. T. WHITE & SON, LTD., ALMA, N.B. (Office at Sussex, N.B., also.)
Two schooners aux. power, 143 ft., 900 tons d. w., first to be launched in April; second in June.

JAMES X. LENTEIGNE, LOWER CARAQUET, N.B.
One schooner, 28 tons, wood.

INTERNATIONAL SHIPBUILDING CO., NEWCASTLE, N.B.
Two four-masted wooden auxiliary schooners, 155 ft. keel, 37 ft. depth, 525 net tons. One to be completed in September and the other December, 1918. For builders' account.

EUREKA SHIPBUILDING CO., NORTH HEAD, N.B.
One wooden schooner, "Mollie & Melba," 350 tons reg.

PORT COLBORNE BUILDING & REALTY CO., LTD., REXTON, N.B. (Head Office, Welland, Ont.)
Four-masted wooden schooner. Has cap. of 3 schooners per year.

GRANT & HORNE, ST. JOHN, N.B.
Two wooden cargo steamers, "War Fundy" (launched Aug., 1918) and "War Digby," 250 ft. x 42 ft. 5 in. x 25 ft. 5 in., 1,000 h.p., speed 9½ knots, 2,800 tons d.w., for undisclosed interests.

MARINE CONSTRUCTION CO., CANADA, LTD., ST. JOHN, N.B.
Four wooden auxiliary, four-masted schooners, 185 ft. o. a., 165 ft. keel x 40 ft., 1,100 d. w. tons, for builder's account. J. Murray Watts, Philadelphia, naval architect. Launching April, 1918.
One wooden schooner, "Dorfontein," 740 reg. tons. Launching June 1918.

ST. JOHN SHIPBUILDING CO., ST. JOHN, N.B. (Plant at Courtenay Bay.)
Ten five-masted auxl. schooners, oil burning engines, for undisclosed interests.
Establishing plant for steel and wood construction.

ST. MARTIN'S SHIPBUILDING CO., ST. MARTIN'S, N.B.
One wooden schooner, 450 tons, three masts. To be launched in July for builder's account.

PETER & A. A. McINTYRE, ST. JOHN, N.B.
One 900-ton schooner under construction.

NEWFOUNDLAND

ANGLO-NEWFOUNDLAND DEVELOPMENT CO., BOTWOOD, NFLD.
Two three-mast aux. schrs., wood, 450 tons, 150 H.P. for the builders' account.

NEWFOUNDLAND SHIPBUILDING CO., HARBOR GRACE, NFLD.
To build ships of 1,200 tons d.w. Steel ships later.

M. E. MARTIN, MORRIS ARM, NR. ST. JOHN'S, NFLD.
Two wooden schooners, 300 tons each, for builder's account.
One wooden schooner, 500 tons, for builder's account.

UNION SHIPBUILDING CO., ST. JOHN, NFLD.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL, N.S.
"Hilda M. Clark," March 4, 1918, 187 ft., 640 tons reg.
Two schrs. three-masted, wood 500 tons, 170 ft. long. To be completed August and December, 1918.

NOVA SCOTIA

B. L. TUCKER, BASS RIVER, N.S.
One schooner, 350 tons, wood.

JAS. S. CREELMAN, BASS RIVER, N.S.
One three-masted schooner, wood, 170 ft. long, 500 tons. To be completed October, 1918, for builders' account.

HANKINSON SHIPBUILDING CO., BELLIVEAU'S COVE, N.S.
One schooner, 360 tons, wood.

ELI PUBLICOVER, BLANDFORD, N.S.

BRIDGEWATER SHIPPING Co., BRIDGEWATER, N.S.
One tern schooner, 450 tons gr., wood. Adapted for aux. power. To be completed Sept., 1918.
One tern schooner, 275 tons gr., wood. Adapted for aux. power. To be completed Nov., 1918.
Both built on owner's account and for sale.

W. A. NAUGLER, BRIDGEWATER, N.S.
One wooden three-masted schooner, "Wm. A. Naugler," 146 ft. o. a., 116 ft. keel x 32 ft. x 11 ft. 6 in., 360 gr. tons, 600 tons cap., for builder's account.
One schooner, 300 tons, wood.

H. MAC ALONEY, CANNING, N.S.
Two wooden schooners, 400 tons each. For builder's account. Launchings July and October, 1918.

S. M. FIELDS, CAPE D'OR, N.S.
One three-masted schooner, 350 tons.
Keel laid for another three-master.

CHESTER BASIN SHIPBUILDERS, LTD., CHESTER BASIN, N.S.
Two schooners, 100 tons, wood. Launchings Aug., 1917, Dec., 1917.
One four-masted schooner, 60 tons. Launching Sept., 1918.
One two-masted schooner, 100 tons. Launching June, 1918.

MORTIMER PARSONS, CHEVERIE, N.S.
One wooden three-masted schooner, 170 ft. x 38 ft. x 14 ft., 575 gr. tons, 900 tons cap., for builder's account. Launching Sept., 1918.
Two wooden three-masted schooners for builder's account.
One tern schooner, "Donald Parsons," 140 ft. keel x 34 ft. 4 in. x 12 ft. 4 in., 500 gross tons, 825 tons d.w. for Mortimer Parsons. Launched May 11, 1918.
Another vessel, same size, to be launched Nov., 1918, for builder's account.

BAY SHORE SHIPYARD, CHURCH POINT, N.S.
Building two wooden vessels for R. C. Elkin, Ltd., St. John, N.B.

MOISE BELLIVEAU, CHURCH POINT, N.S.
One schooner, 450 tons, wood.

FIDELE BOUDREAU, CHURCH POINT, N.S.
One schooner, 350 tons, wood.

J. E. GASKILL, CHURCH POINT, N.S.
Other yards at Grosses Coques, Little Brook, Meteghan and Port Wade, N.S.
Five wooden schooners from 344 to 387 reg. tons. All sister ships.

COMEAU SHIPBUILDING CO., COMEAUVILLE, N.S.
One three-masted wooden schooner, for builder's account, 450 tons.

J. W. COMEAU, COMEAUVILLE, N.S.
One schooner, 329 tons, Jan., 1918.

J. N. RAFUSE & SONS, CONQUERALL BANKS, DIGBY CO., N.S.
(Other plants at Salmon River and Shelburne, N.S.)
Two wooden three-masted schooners, 120 ft. x 32 ft. x 12 ft., 760 tons cap., for builder's account. For the market. Launchings Oct. 25, 1917, and Jan. 10., 1918.
One three-masted wooden schooner, "Integra," 112 ft. x 30 ft. x 11 ft. 6 in., 600 tons cap., for J. O. Williams & Co., St. John's, Newfoundland. Launching Nov. 25, 1917.

E. F. WILLIAMS, DARMOUTH, N.S.
One schooner, 360 tons, wood.

ROBAR BROTHERS, DAYSPRING, N.S.
Schooner for Capt. Ivan Creaser, Dayspring.

MAURICE E. LEARY, DAYSPRING, N.S.
One wooden schooner, 225 tons, 135 ft. o. a. To be launched Aug. 15, 1918, for La Have Outfitting Co., La Have, N.S.

J. NEWTON PUGSLEY & CHAS. ROBERTSON, DILIGENT RIVER, N.S.
One schooner, three-masted, 475 tons.

McLEAN & McKAY, ECONOMY, N.S.
One tern schooner, wood, 400 tons net, 135 ft. keel. To be launched Sept. 1. 1918, for builders' account.

S. J. SOLEY, ROX RIVER, N.S.
One schooner, three-masted, 121 ft. keel, 300 tons. Built of native wood. To be launched Sept., 1918. For builder's account. For sale.

ALLAN & FRASER, FRASERVILLE, N.S.
One schooner, 350 tons, wood.

BERNARD W. MELANSON, GILBERT'S COVE, N.S.
One three-masted schooner, wood, 250 tons net. To be completed November, 1018, for builder's account and for sale.

AMOS BLINN, GROSSES COQUES, N.S.
One schooner, 375 tons. Jan., 1918.
One schooner, 350 tons, wood.

BINN BROS., GROSSES COQUES, N.S.

F. K. WARREN & CO., GROSSES COQUES, N.S. (Offices in Union Bank Chambers, Halifax, N.S., also.)
350-ton tern schooner, under construction Jan., 1918.

HALIFAX SHIPBUILDING CO., HALIFAX, N.S.

J. WILLARD SMITH, HILLSBURN, N.S. (Head Office, St. John, N.B.)
One tern schooner, wood, 140 ft. keel, 35 ft. beam, 450 tons net reg. tons.

J. W. RAYMOND, LITTLE BROOK, N.S.
Building 500-ton wooden schooners for local owners.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S.
One 800-ton vessel for undisclosed interests. Launch about Dec. 24.

CONRAD & REINHARDT, LUNENBURG, N.S.
"Excellent." 600-ton, launch in January next. Also 175-ton schooner.

J. WILLARD SMITH, HILLSBURN, N.S.
Wooden three-masted schooner. Launch in April, 1919.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
750-ton auxiliary schooner. Completed in January, 1919.

OSMOND O'BRIEN & CO., NOEL, N.S.
"J. Miller," 700 tons. Keel laid April 18. Launched Nov. 20. Completed Nov. 27.

BERNARD & MELANSON, GILBERT'S COVE, N.S.
550-ton vessel for owner's account. Completed Nov. 25.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL
"Mapleland," 1000-ton schooner, fitted with twin Fairbanks-Morse oil engines, 200 horsepower. Complete about Dec. 10. For builder's account.

L. S. CANNING, WARD'S BROOK, N.S.
"W. C. Smith," 700 tons. To be completed Dec. 18.

McLEAN & McKAY, ECONOMY, N.S.
"Truro Queen," 750 tons, 15 h.p. engine for hoisting sails and anchor. Completed.

HENRY COVEY, INDIAN HARBOR, N.S.

CHARLES GRIFFIN, ISAACS HARBOR, N.S.
One schooner, 40 tons, wood.

LEWIS SHIPBUILDING CO., LEWISTON, N.S.
One schooner, 670 tons. Jan., 1918.

INNOCENT COMEAU, LITTLE BROOK, N.S.
One three-masted schoner, 140 ft. x 35 ft. 6 in. x 17 ft. 6 in., 650 gr. tons, for the Weymouth Shipping Co., Weymouth, N.S., Can. Delivered Jan. 18, 1918.

J. W. RAYMOND, LITTLE BROOK, N.S.
One wooden schooner, No. 4, 140 ft. x 36 ft. x 17 ft., 575 gr. tons, for Jones Bros., Weymouth, Digby Co., N.S.

H. A. FRANK, LIVERPOOL, N.S.
Two wooden schooners, 500 tons, for builder's account.

McKEAN SHIPBUILDING CO., LIVERPOOL, N.S.
One wooden three-masted schooner, 126 ft. keel x 3 ft. x 12 ft. 9 in., 700 tons d.w., for builder's account. Launching May, 1918.

W. F. McKEAN & CO., LIVERPOOL, N.S.
One schooner 400 tons, Jan., 1918.

D. C. MULHALL, LIVERPOOL, N.S.
Two wooden schooners, one 300 gross tons, other 400 gross tons, for undisclosed interests.

ROBIN, JONES & WHITMAN, LIVERPOOL, N.S.
One schooner, 340 tons, wood.

SOUTHERN SALVAGE CO., LIVERPOOL, N.S.
One wooden schooner, three masts, 300 gross tons, 600 tons capacity, for a West Indian firm. Launching Jan., 1918.
One wooden steamer, No. 5, 250 ft. x 43 ft. 6 in. x 25 ft., 2,900 gr. tons, 10 knots, 1,000 h.p., for undisclosed interests. Launching Fall, 1918.
One two-masted schooner, "Win-the-War," 137 ft. o. a. x 25 ft. 2 in. x 11 ft. 6 in. ,187 gr. tons, for the builder's account. Launched Nov., 1917.

CONRAD & REINHARDT, LUNENBURG, N.S.

LUNENBURG MARINE RAILWAY, LUNENBURG, N.S.

FRED A. ROBAR, LUNENBURG, N.S.

J. B. YOUNG, LUNENBURG, N.S.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
One two-masted schooner, 120 ft. o. a. x 25 ft. 6 in. x 10 ft. 6 in., 200 tons d.w., for Lunenburg Outfitting Co. April, 1918. Christened "Madeline Adams."
One three-masted schooner 125 ft. keel x 32 ft. x 12 ft., 600 tons, d. w. To be delivered July, 1918.
Two masted schooner, "Agnes D, McGlaston," 130 ft. x 26 ft. 8 in. x 10 ft. 8 in. Launched Nov. 13, 1917.
Keel laid for three-masted wooden schooner, 200 tons.

J. ERNEST & SON, MAHONE BAY, N.S.
One schooner, 520 tons. Jan., 1918.

O. A. HAM, MAHONE BAY, N.S.
One schooner, "Dozle," 128 tons. Launching May 30. One motor boat about 20 tons.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S. (Leased to Montague Mahaffy, Toronto.)
One three-masted schooner, 325 tons gr. reg., 500 tons cap., West Indies freight type. Will be launched in July.
Keel laid for another three-masted schooner with cargo capacity of 425 tons.

JOHN McLEAN & SONS, MAHONE BAY, N.S.
One schooner, 95 tons, wood.

J. A. BALSOM CO., LTD., MARGARETSVILLE, N.S.
One schooner, 409 tons. Jan., 1918.

CLARE SHIPBUILDING CO., METEGHAN RIVER, N.S.
One wooden schooner for builder's account. 400 tons.

A. H. COMEAU & CO., METEGHAN, N.S.
One schooner, 400 tons, wood.

AGAPIT COMEAU, METEGHAN, N.S.

JOHN F. DEVEAU, METEGHAN, N.S.
A 300-ton schooner was launched recently for Ritcey & Co., Lunenburg, N.S., and named Charles A. Ritcey.
1 schooner, 425 tons. Jan., 1918.
1 schooner, 400 tons, wood.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
One wooden sailing schooner, 800 tons d.w. Keel laid April 15th, 1918, to be launched December 17th and completed December 31st. Built for sale.

J. E. GASKILL, CHURCH POINT, N.S.
One wooden schooner, 750 tons d.w. Keel laid March, 1918, to be launched December 15th. Built for J. E. Corkill.

THERIAULT SHIPBUILDING CO.
One wooden vessel, 500 tons d.w. Keel laid September 18th, to be launched in May, 1919. Built for owners account.

SIDNEY ST. C. JONES, WEYMOUTH, N.S.
One tern schooner, "Westway," 450 tons d.w. Keel laid April 18, to be launcheed December 30, 1918, and completed in January, 1919. Built for sale. 130 feet by 28 feet 8 inches beam by 10 feet 6 inches deep.

THE HANKINSON SHIPPING CO., BELLEVEAU'S COVE, N.S.
One vessel, 750 tons d.w. "Charles Doucet," fitted for auxiliary engine. Keel laid April 1, to be launched December 17. One vessel 750 tons d.w. Keel laid Aug., 1918, to be launched April, 1919, and completed. Built for owners account.

FAUQUIER & PORTER, HANTSPORT, N.S.
One vessel 1,800 tons d.w. to be fiitted with two 100 h.p. crude oil engines (Canadian Fairbanks-Morse), to be launched Dec. 17, 1918, and completed January, 1919. Built for sale. Propose to lay keels for two 500-ton, 3-mast schooners as soon as this schooner is launched.

N.S. SHIPBUILDING & TRANSPORTATION CO., LIVERPOOL, N.S.

"Protea," 400 tons d.w., three-masted schooner with provision for Morse semi-Diesel engines. Keel laid Nov. 18. To be completed May account and sold to Pearson & Walker, Cape Town, S.A.

"Gordon T. Tibbs," 400 tons d.w., three-masted schooner. Keel laid Aug. 30. To be launched Dec. 15 and completed Jan. 19. Built for builder's account and sold to G. Tibbs & Sons, St. John's, Nfld.

One beam trawler, 900 tons d.w., 400 i.h.p., with two 200 Fairbanks-Morse semi-Diesel engines. Keel laid Nov. 19. To be completed May next. Built for Rafuse Grey et al Le Havre. Repairing schooner Karmoe for N.Y. owners.

H. ELDERKIN & CO., PORT GREVILLE, N.S.

Two vessels, 825 and 500 tons respectively. Keel laid April and August. To be launched December and January. Built for builder's account.

J. E. GASKILL, METEGHAN, N.S.

THOMAS GERMAN, METEGHAN, N.S.

One schooner, 350 tons, wood.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S. (Leased James Cosman's shipyards.)

Building several wooden schooners for own account.

DR. F. H. MACDONALD, METEGHAN, N.S.

One wooden four-masted schooner, "Rebecca L. Macdonald," 201 ft. o. a. x 6 ft. x 16 ft., 800 gr. tons, 1,500 tons d.w., for builder's account. Launching January 1, 1918.

One wooden fishing schooner, No. 3, 84 ft. x 17 ft. x 7 ft., 50 gr. tons, 5 h.p. Launching August, 1918.

One schooner, 544 tons, wood.

METEGHAN RAILWAY & SHIPBUILDING CO., METEGHAN, N.S.

One wooden three-masted schooner, 182 ft. x 35 ft., 450 gr. tons.

One schooner, 470 tons, wood.

CHAS. McNEIL, NEW GLASGOW, N.S.

One wooden 3-masted schooner, 103 ft. x 30 ft. x 10 ft. 9 in., 200 tons, for builder's account. Launching July, 1918.

One wooden 3-masted schooner, 142 ft. x 25 ft. 4 in. x 13 ft., 500 gr. tons, for builder's account. Launching Oct., 1918.

THE NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

Two steel freight steamers, 257 ft. 9 in. x 35 ft. x 20 ft., 1,700 gr. tons, 2,350 tons cap., trip. exp. engines, boilers 10 ft. 6 in. x 11 ft. 6 in., 800 h.p., 8.5 knots, for undisclosed interests. Launching of one Jan. 1918.

Two steel cargo strs. Raised quarter deck type. 248 ft. 9 in. long, 1,649.68 gross tons. Triple expansion engines, 17, 28, 46 x 33 in. stroke. One, the "War Bee," for undisclosed interests to be completed June, 1918. Other for Steel Co., to be completed Oct., 1918.

Two masted schooner, launched May 16, 130 ft. o. a. x 26 ft. x 10 ft. 6 in. Designed by J. S. Gardner.

O'BRIEN BROS., NOEL, N.S.

One schooner, 325 tons, wood.

W. R. HUNTLEY & SON, PARRSBORO, N.S.

One wooden schooner, 175 ft. x 39 ft. x 17 ft., 900 gross tons, for

C. T. WHITE & SON, SUSSEX, N.S.

Two schooners, 325 tons each. Jan., 1918.

One schooner, 490 tons, wood.

One schooner, 850 tons, four masted.

WAGSTAFF & HATFIELD, PARRSBORO, N.S.

One schooner, 400 tons. Jan., 1918.

S. SALTER, PARRSBORO, N.S.

One 200-ton schooner, wood.

DOWLING & STODDART, PORT CLYDE, N.S.

One gas boat, 27 tons, wood.

One schooner, 300 tons, wood.

SWIME BROS., PORT CLYDE, N.S.

Several small motor trawlers, for builder's account.

G. M. COCHRANE, PORT GREVILLE, N.S.

One tern schooner, "Alfredock Hedley," 152 ft. 6 in. x 36 ft. 12 ft. 6 in., 461 tons reg., for Adam B. Mackay, of Hamilton, Ont. Launched Jan., 1918.

One 4-masted schooner, 850 tons, 155 ft. x 37 ft. x 18 ft., 2 decks, wood. To be completed Oct., 1918, for builder's account.

ELLIOTT GRAHAM, PORT GREVILLE, N.S.

Is building a schooner, "Khaki Lad," of about 325 tons, at Port Greville, N.S., for J. W. Kirkpatrick and others. She will be launched early in October, and is reported to have been sold to Newfoundland parties.

One schooner, 360 tons. Jan., 1918.

SMITH CANNING CO., PORT GREVILLE, N.S.

One schooner, 350 tons, wood.

WAGSTAFF & HATFIELD, PORT GREVILLE, N.S.

One schooner, 400 tons, wood.

WILLIAM CROWELL, PORT LATOUR, N.S.

J. W. RAYMOND, PORT MAITLAND, N.S.

One schooner, 375 tons. Jan., 1918.

PORT WADE SHIPBUILDING CO., PORT WADE, N.S. (Head Office, Digby.)

One 350-ton schooner, wood.

JOHN BROWN, PUBLIC LANDING, N.S.

One tow barge, 50 tons, wood.

THE CUMBERLAND SHIPBUILDING CO., PUGWASH, N.S.

Establishing plant for the construction of wooden ships.

MACKENZIE SHIPPING CO., RIVER JOHN, N.S.

One four-masted schooner, 600 tons, wood. About half built. Fitted for aux. engines.

CHARLES McLELLAN, RIVER JOHN, N.S.

One schooner, 100 tons, wood.

W. J. FOLEY, SALMON RIVER, N.S.

Building for J. N. Rafuse & Sons one wooden, 300 tons, under construction. Cap. of plant, 1,000 tons yearly.

J. N. RAFUSE & SONS, SALMON RIVER, N.S. (Other plants at Shelburne and Conquerall Banks.)

Launched recently a three-masted schooner named "Industrial," at W. J. Foley's ship yard at Salmon River, N.S., of the following dimensions: length, 113 ft, breadth, 30 ft., depth, 11½ ft., 325 tons.

ACADIAN SHIPPING CO., SAULNIERVILLE, N.S.

One schooner, 00 tons, wood.

SAULNIERVILLE SHIPBUILDING CO., LTD., SAULNIERVILLE, N.S.

J. LEWIS & SONS, SHEET HARBOR, N.S.

One schooner, wood, four-masted, 725 gr. tons. To be completed Sept., 1918. For private account.

GEO. A. COX, SHELBURNE, N.S.

One schooner, 200 tons, wood.

One schooner, 322 tons, wood.

JOSEPH McGILL SHIPBUILDING & TRANSPORTATION CO., SHELBURNE, N.S.

"Sparkling Glance," 246 tons register, for Harvey & Co., St. John's, Nfld.

One schooner, 160 tons, wood.

W. C. McKAY & SON, SHELBURNE, N.S.

One wooden schooner, 130 ft. o. a. x 26½ ft. x 11 ft. depth of hold, 140 tons register. Launched Dec. 1, 1917.

One three-masted schooner, for Messrs. Hallet, of Newfoundland.

One schooner, 620 tons, wood.

J. N. RAFUSE & SONS, SHELBURNE, N.S. (Other plants at Salmon River and Conquerall Banks.)

One wooden three-masted schooner, 120 ft. x 32 ft. x 12 ft., 700 tons cap., for builder's account. For the market. Launching Jan. 10, 1918.

One wooden three-masted schooner, 118 ft. x 33 ft. x 12 ft., 700 tons cap., for builder's account. For the market. Launching Jan. 15, 1918.

Two three-masted wooden schooners, 122 ft. 6 in. keel x 32 ft. x 12 ft., 275 net tons, for J. O. Williams & Co., St. John's, Newfoundland. One to be built at Salmon River yard and one at Ship Harbor.

THE SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.

One tern schooner, "Misty Star," 145 ft. x 31 ft. x 11 ft. 6 in., 600 tons d.w., 330 tons gross, for Harvey & Co., St. John's, Newfoundland. Launching Mar. 15, 1918.

One tern schooner, 154 ft. x 32 ft. x 12 ft. 4 in., 400 gr. tons, 700 tons d.w. cap. Launching June, 1918. Not sold yet.

Two schooners, one 349 tons, other 400 tons.

EASTERN SHIPBUILDING CO., SHIP HARBOR, N.S.

One wooden schooner, 600 tons d.w., for J. N. Rafuse & Sons., Halifax, N.S., Can.

One wooden schooner, 300 tons.

STEPHEN MORASH & CO., SHIP HARBOR, N.S.

One wooden schooner, 150 ft. x 37 ft. x 13 ft., four masts, for Canadian interests. Keel laid Feb. 5, 1917.

JAMES E. PETTIS, SPENCER'S ISLAND, N.S.

One schooner, 425 tons, wood, three-masted.

CAPE BRETON SHIPBUILDING CO., SYDNEY, N.S.

THE TUSKET SHIPBUILDING CO., TUSKET, N.S.

AMOS H. STEVENS, TANCOOK, N.S.

ALVIN STEVENS, TANCOOK, N.S.

STANLEY MASON, TANCOOK, N.S.

ALBERT PARSONS, WALTON, N.S.

One schooner, 400 tons. Jan., 1918.

H. T. LeBLANC, WEDGEPORT, N.S.

One steam trawler, 165 ft., 600 tons, for J. N. Rafuse & Sons.

L. S. CANNING, WARDS BROOK, N.S.

One tern schooner, 350 tons, for W. C. Smith & Co., Lunenburg, N.S

WEDGEPORT NAVIGATION & TRANSPORTATION CO., WEDGEPORT, N.S.

T. K. BENTLEY, WEST ADVOCATE, N.S.

One 200-ton steamer.

One 4-masted schooner, wood, 511 tons. To be launched September or October. For owner's account.

J. W. KIRKPATRICK, WEST ADVOCATE, N.S.

One 350-ton schooner, wood.

BOEHNER BROS., WEST LA HAVE, N.S.

Two large fishing schooners, 150 tons each.

One beam trawler, 300 tons, crude oil engines. For local interests.

BEAZLEY BROS., WEYMOUTH, N.S. (Head Office Roy Bldg., Halifax.)

One schooner, 394 tons, three masts.

E. R. GAUDET, WEYMOUTH, N.S.

One 350-ton schooner, three-masted.

E. P. RICE, WEYMOUTH, N.S.

One three-masted schooner, 350 tons.

RICE, WARREN & CO., WEYMOUTH, N.S.

One three-masted schooner, 334 tons.

FALMOUTH SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

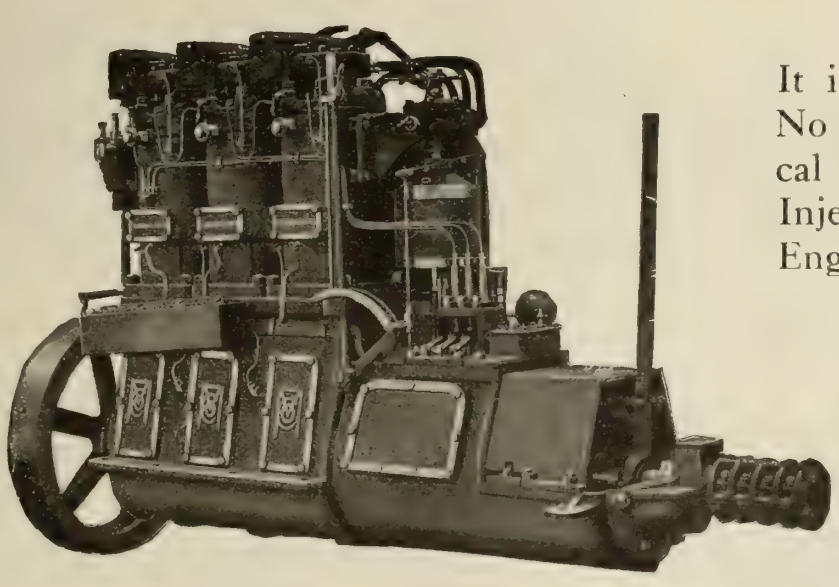
One wooden schooner, 350 gr. tons, 700 tons cap., for undisclosed interests.

NOEL SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

One wooden schooner, three masts, 138 ft. x 35 ft. x 13 ft., 450 net reg. tons. Oil auxiliary engines. Launching August, 1918, for builder's account.

Fairbanks-Morse
TYPE "C-O" HEAVY DUTY ENGINE

This engine is designed to use efficiently such a great variety of oils, that the cheaper grades procurable in almost any port are suitable for it.



It is extremely simple—No Valves — No Electrical Ignition — No Water Injection — No Trained Engineer.

Hundreds of them are now in successful operation and many are being installed.

We can furnish complete mechanical equipment for your shops and your ships.

Let our nearest house quote on your specifications.

The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House for Mechanical Goods"

HALIFAX ST. JOHN QUEBEC MONTREAL OTTAWA TORONTO HAMILTON WINDSOR
WINNIPEG SASKATOON CALGARY VANCOUVER VICTORIA

If any advertisement interests you, tear it out now and place with letters to be answered.

C. A. NICKERSON, WOODS HARBOR, N.S.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.

Taken over and enlarging old plant of James Jenkins.

350-ton schooner building.

W. O. SWEENY, YARMOUTH, N.S.

100-ton fishing schooner.

YARMOUTH SHIPBUILDING CO., YARMOUTH, N.S.

One 450-ton wooden schooner, 128 ft. keel. To be completed Oct., 1918.

ONTARIO

CAN. ALLIS-CHALMERS (Head Office, Toronto), BRIDGEBURG, ONT.

Six standard freight steamers, 3,500 tons, 261 feet long, for undisclosed interests.

COLLINGWOOD SHIPBUILDING CO., COLLINGWOOD, ONT.

Two steel cargo steamers, Nos. 51-52, 50 ft. x 43 ft. x 25 ft., 2,500 gr. tons, 2,900 tons d. w., triple expansion engines 18-30-50 x 36, 2 boilers 14 ft. x 11 ft., 10 knots, for undisclosed interests. Delivery May and Aug., 1918.

Four deep-sea trawlers, Nos. 53-58, inclusive, 125 ft. x 23 ft. 6 in. x 13 ft. 6 in., 288 gross tons, 12¾-21½-35/24 engines, 1 cylinder 13 ft. 6 in. x 10 ft. 6 in., 10 knots, 500 h.p. for undisclosed interests.

One steel freight steamer of 3,800 tons d. w. for undisclosed interests. Keel laid May 8, 1918.

"War Wizard," May 8, 1918, 3,000 tons d. w., 261 ft. x 43 ft. 6 in. x 20 ft. depth. For undisclosed interests.

"War Witch" same size, now building. To be launched ——

R. MORRILL, COLLINGWOOD, ONT.

"Windsor," Aug. 10, steam tug, 105 ft., for Ontario Gravel & Freighting Co.

CAN. CAR & FOUNDRY CO., FORT WILLIAM, ONT. (Head Office Transportation Bldg., Montreal.)

Twelve steel mine sweepers for French Government.
145 ft. o.a. steel construction, value $2,500,000.
Plant under construction.

GREAT LAKES DREDGING CO., FORT WILLIAM, ONT.

Two wooden vessels, 2700 tons d.w. cap., 260 ft. o.a., 43 ft. beam. Triple expansion engines of 1,000 h.p. To be launched November, 1918.

"War Sioux" launched May 12, 1918. Keel laid for another twenty minutes later. Launching scheduled for November.

THUNDER BAY CONTRACTING CO., FORT WILLIAM, ONT.

One wooden freight steamer, 261 ft. long, for undisclosed interests.

NATIONAL SHIPBUILDING CO., GODERICH, ONT.

KINGSTON SHIPBUILDING CO., KINGSTON, ONT.

Several steel trawlers for undisclosed interests. First one launched Dec. 22, 1917.

SELBY & YOULDSON, KINGSTON, ONT.

GEORGIAN BAY SHIPBUILDING & WRECKING CO., MIDLAND, ONT.

Tug, 50 tons, wood.

One tug 40 tons, wood.

MIDLAND DRY DOCK CO., MIDLAND, ONT.

Three steel freight steamers, 261 ft. x 43 ft. 6 in. x 23 ft., 3,400 tons d. w., 10 knots, for undisclosed interests. Deliveries, one in July, 1918, and two others before close of navigation, 1918.

Alterations on steamers "Mariska" and "Glenlyon."

"Western Star" being reconstructed.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONT.

Six steel trawlers on order. 135 ft. o. a. x 23 ft. 4 in. x 15 ft. 1 in., 294.5 tons, trip. exp. engines, 500 h.p., single end Scotch boiler. Two-masted.

MUIR BROS. DRYDOCK CO., LTD., PORT DALHOUSIE, ONT.

J. W. GEROW, ROSSPORT, ONT.

REID WRECKING CO., SARNIA, ONT.

One steel tug, 157 ft. x 32 ft. x 19 ft., trip. exp. engines, for lake or ocean service. Keel blocks laid March 5. Launching July, 1918. For Reid Wrecking Co

"Tento," Oct. 22, 1917, 261 ft., 3,500 tons d.w. steel. For Norwegian interests. Transferred to British registry.

POLSON IRON WORKS, TORONTO

Six steel cargo steamers, Nos. 145 to 150 inclusive, for the Imperial Munitions Board. Length 261 feet overall, 43 feet 6 inches beam and 23 feet deep, 2,350 approximate gross tons, 3,500 d.w. capacity; single screw triple expansion engine, 20½ by 33 by 54 by 36-inch stroke. 1,250 h.p., two 14 feet by 12 feet Scotch boilers 180 lbs. per sq. inch w.p.

DAVIS DRY DOCK CO., KINGSTON, ONT.

Building wooden and metallic lifeboats, general repairs.

DOMINION SHIPBUILDING CO., TORONTO, ONT.

"Le Quesnoy," 4,300 tons gross, 1,400 h.p. Triple expansion engines, 2 Scotch marine boilers, to be launched Nov. 23. Built to builder's account, Canadian registry. Also three 3,500-ton steamers on stocks in course of construction and three others same type going through shops. All ships classed.

FORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONTARIO

"War Fiend," 3,500 tons d.w., triple expansion engines, 1,300 h.p. Scotch boilers. Launched Oct. 24, 1918. To be completed Nov. Built for the Imperial Munitions Board.

"War Karma," 3,400 tons deadweight. Built for the Imperial Munitions Board. Launched October 26. Will be completed last week of Nov. Triple expansion engines, 20½ by 34 by 56 by 40-inch stroke. 2 Scotch boilers, 15 feet by 11 feet, working pressure 190 lbs. per sq. inch.

TORONTO SHIPBUILDING CO., LTD., TORONTO, ONT. (Toronto Dry Dock Co., Ltd., under same management.)

Two wooden cargo steamers, 250 ft. B.P. 42 ft. 6 in., moulded breadth 25 ft., moulded depth 22 ft., draft 2,500 tons d. w. Triple exp. engines $20 \times 33 \times 54$

$\frac{\quad}{40}$. Howden boiler. Launchings July and Sept., 1918. For undisclosed interests.

THE BRITISH AMERICAN SHIPBUILDING CO., WELLAND, ONT.

Two steel frs., 3,500 tons d. w., 261 ft. O.A., 43 ft. beam, 23 ft. moulded depth, Westinghouse steam turbine engines. Delivery 1918.

WELLAND SHIPBUILDING CO., WELLAND, ONT.

One steel freight steamer, "War Weasel," 261 ft. x 43 ft. 6 in. x 23 ft., 3,300 tons d. w., trip. exp. engines, 14 ft. x 12 in. Scotch boilers, 10 knots, 1,250 h. p. Launching April, 1918.

Two deep frame cargo vessels, "War Badger" and "No. 3," 261 ft. x 43 ft. 6 in. x 23 ft., 3,300 d. w. tons, geared turbines, Howden's forced draught boilers, 10 knots, 1,250 h.p. Launchings June and August, 1918.

PRINCE EDWARD ISLAND

THE CARDIGAN SHIPBUILDING PLANT, CARDIGAN, P.E.I. (Purchased Annandale Lumber Co. plant and removed to Cardigan.)

One three-masted schooner, 325 tons, to be completed November, 1918

QUEBEC

TIDEWATER SHIPBUILDERS, LTD., THREE RIVERS, QUE.

R. N. LE BLANC, BONAVENTURE, QUE.

J. Z. DEGAGNE, EBOULEMENTS, QUE.

DAVIE SHIPBUILDING & REPAIRING CO., LEVIS, QUE.

Six military barges, 130 feet long.
Eight steel trawlers, 2,035 tons.
One floating crane, 350 tons.
One steel cargo vessel of 5,000 tons cap.
Building several steel lighters and several wooden drifters.

Steel car ferry "Canora" building for C.N.R., 308 ft. x 52 ft., cap. 20 loaded cars. Speed, 14 knots.

ATLAS CEMENT CONSTRUCTION CO., LTD., MONTREAL, QUE.

One concrete cargo steamer, "Concretia," 125 ft. x 22 ft. x 13 ft., steel ribbed, hull to be from 3 in. to 5 in., thick, for the builder's account.

CANADIAN VICKERS, LTD., MONTREAL, QUE.

Two cargo steamers, 9,400 tons, steel; 1 dredge, 2,364 tons, steel; 12 trawlers, 3,050 tons, steel; 23 drifters, 3,350 tons, wood.

Six freight steamers, 24 ft. draught, 7,000 tons cap., 11 knots, for undisclosed interests. Delivery, 1917, of two for Norwegian interests. "Porsanger," 394 ft. 6 in. o. a. x 40 ft. 4 in. x 30 ft., triple exp. engines, launched Nov. 29, 1917.

"War Earl" launched June 8, 1918, 7,000 tons d.w., 380 ft. x 49 ft Keel of sister ship laid five minutes after this launching.

One steel freight steamer, 2,360 tons, cap., for undisclosed interests.

Three steel cargo vessels, 8,200 tons, to be laid down in May, Aug. and Sept., 1918, for undisclosed interests.

FRASER BRACE & CO., MONTREAL, QUE.

Four wooden cargo steamers, 3,000 tons, for undisclosed interests. Two keels laid during Oct., 1917.

HALL ENGINEERING CO., MONTREAL, QUE.

MONTREAL DRY DOCK & SHIP REPAIRING CO., MONTREAL, QUE.

Operate dock 428 ft. long 30 ft. deep.

MONTREAL SHIPBUILDERS LTD., 37 Belmont St., MONTREAL, QUE. (Associated with Atlas Construction Co.

THE QUEBEC SHIPBUILDING AND REPAIR CO., Board of Trade Bldg., MONTREAL, QUE.

2 vessels for undisclosed interests 3,000 tons each.

QUINLAN & ROBERTSON, MONTREAL, QUE. (Yards at Quebec.)

Four wooden steamers, for undisclosed interests.

LOUIS GAUNDRY, 12 St. Peter St., QUEBEC, QUE.

QUEBEC SHIPBUILDING & REPAIR CO., ST. LAURENT, QUE.

2 schrs. 1,400 tons and 1,200 tons.

One wooden four-masted auxl. schooner "Martin Connolly," 223 ft. x 42 ft. x 20 ft., 2,100 tons d. w., for undisclosed interests. Launched Oct. 28, 1917.

QUINLAN & ROBERTSON, QUEBEC, QUE.

Four wooden steamers, totalling 6,400 tons, for undisclosed interests.

CANADIAN GOVERNMENT SHIPYARDS, SOREL, QUE.

One steel vessel for undisclosed interests.

H. H. SHEPHERD, SOREL, QUE.

Rebuilding seven drifters. Particulars withheld owing to govt. restrictions.

SINCENNES-McNAUGHTON LINES. SOREL, QUE.

One tug 410 tons, wood.

CAN. GOVERNMENT SHIPYARD, SOREL, QUE.

One steel vessel for undisclosed interests.
Building steam trawlers and wooden drifters for undisclosed interests

LECLAIRE SHIPBUILDING CO., SOREL, QUE.

Six steel trawlers 125 feet long with single screw triple expansion engines, 500 i.h.p. Two of these launched in November. One more to be launched before ice comes in. Six wooden auxiliary schooners fitted with twin screw "Skandia" engines of 120 h.p. each. These will be all in frame at the end of November and four ready for launching as soon as ice is clear next spring.

NATIONAL SHIPBUILDING CORPORATION, THREE RIVERS, QUE.

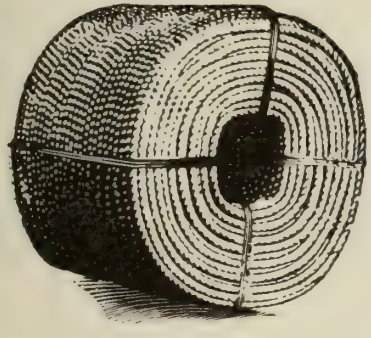
"War Mingan" and "War Radnor," launched Oct. 15 and No. 2 Built for the Imperial Munitions Board and will be operated by Arning Bros., Cardiff, Wales. Now building 10 self-propelling barges for France.

ESTABLISHED 1871

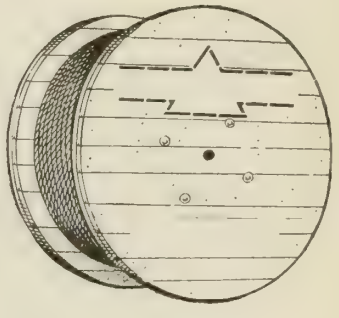
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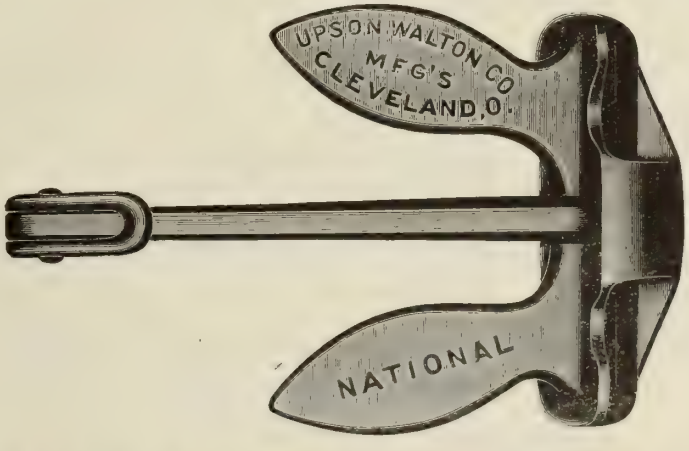






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Full Equipment for Ocean Going Ships.

ADMIRALTY COURT REPORTS

Continued from page 37

John Street, the Third Officer, deposed that although he was in his room when the fire was discovered, he remained indifferent to the jeopardy in which the ship was placed by standing aloof, and at the termination of the watch which he subsequently kept on the bridge he returned to his room with the same careless indifference as to the success or failure of the battle which was being waged against the fire by practically every man on the ship.

The Court having considered the evidence already adduced sufficiently conclusive to warrant its decision, it therefore adjourned sine die.

FINDING

Re Fire in Cargo of SS. "Somali."

The Court having carefully weighed the evidence as set forth by the crew of the SS. "Somali," and examined the hold where the fire originated and the various circumstances attending same, cannot arrive at a conclusion other than that inflammable material was wilfully placed amongst cases of lard stowed in No. 1 lower hold.

In the order mentioned, wheat, deals, lard, cheese and oats comprised the cargo of the lower hold and as these materials are presently removed from the ship the tracing of the destructive agency is rendered more difficult. It follows, nevertheless, that as none of the materials cited could possibly by their own elements create spontaneous combustion, a foreign substance was necessarily introduced, traces of which the ensuing fire unfortunately obliterated.

A so-called supervision of cargo entering the ship was exercised by the Second Officer, but this supervision relaxed into uselessness on the part of the Third Officer, while the Chief Officer frankly admitted that he witnessed smoking in the holds by laborers to an extent to justify his complaining to the Montreal Officials, who informed him that the pernicious practice could not be controlled.

Under normal conditions the nature of the "Somali" cargo would not exact a rigid supervision from the standpoint of thievery, but as we realize that the dark hand of the enemy is ever ready to strike through the treasure of our ships, the Court is of opinion that an unflinching surveillance should be exercised of the men permitted to enter the ship, and if the vessel's crew should prove inadequate, it is suggested that a military picket be detailed to assist in this most essential duty.

It was at 7 p.m., twenty-four hours after completing cargo, and while at anchor in Quebec, that the first indication of fire was given by a thin veil of smoke coming from the starboard ventilator. This danger signal was promptly communicated to the Captain, who together with the responsible Officers of the ship first utilized the chemical extinguishers by their application down the starboard ventilator, following which the pumps were set in operation and three lines of hose spread which supplied a sufficient volume of water to gradually fill the hold, while a naval vessel which had been signalled rendered additional assistance. In fact, from the first intimation of fire to its final extinction, the Offcers and crew exerted the maximum of effort to cope with the crisis.

A circumstance which created some suspicion was the discovery amongst the cheese boxes in the hold of an ordinary cement bag containing approximately twenty pounds of wheat. After the Court, however, had tasted this wheat and furthermore tested its inflammability with matches, the conclusion was arrived at that no significance is to be attached to its discovery more than that it was the frustrated act of a petty thief.

Additional witnesses were not summoned by the Court as the evidence on the part of the ship's Officers was sufficiently conclusive to justify the opinion already expressed in the first part of this finding, and it is therefore suggested that, in view of the belief that the fire was of arsonic origin that extreme care and vigilance should be exercised for the safeguarding of the cargo and the ship.

The Court cannot accept as seriously meant the reply made to the complaint of the Chief Officer regarding the pernicious practice of smoking in the hold by employees, and consequently urges that minute search be made of persons embarking on the vessel and that matches and smoking material be strictly prohibited, which search would serve the double purpose of first preventing the ever dangerous custom of smoking and at the same time remove the still more dangerous possibility of the introduction into the ship of a foreign substance with criminal intent.

Read in Court this 18th day of October, 1918.

L. A. DEMERS,
Dominion Wreck Commissioner.

Concurred in:
CHARLES KOENIG,
G. HOULGRAVE.

RE SS. "SIBERIAN PRINCE" STRANDING

In the matter of a formal investigation held in the Court House, Halifax, N.S., on July 22nd, 1918, to inquire into the cause which led to the stranding of the SS. "Siberian Prince" on Egg Islet, N.S., in June, 1918. The Court was presided over by Captain L. A. Demers, F.R.S.A., F.R.A.S., Dominion Wreck Commissioner, assisted by Commander G E. Bridge, R.N.R., and Commander C. J. Stuart, R.N.R., as Assessors.

Mr. W. A. Henry, K.C., appeared on behalf of the Master and Third Officer, for the Imperial Merchants Service Guild, and Mr. L. A. Lovett, K.C., on behalf of the owners of the "Siberian Prince."

Hector Alexander Camp, Master, deposed

Continued on page 64

LEADERS IN PEACE OR WAR

With the Advent of Peace

we wish to announce that we are in a position to supply Gyro-Compasses for use on ships of the Merchant Marine.

During the War

nearly one thousand Sperry Gyro-Compasses have been constant aids on thousands of miles of patrol covered by each vessel of the Allied navies under all conditions of weather, and proved of invaluable assistance in navigating hazardous waters and making rendezvous at all times of day and night.

The compass being non-magnetic, is not subject to the usual errors and discrepancies of the magnetic compass, and thereby insures a truer course with greater safety and economy of time.

THE SPERRY GYROSCOPE COMPANY

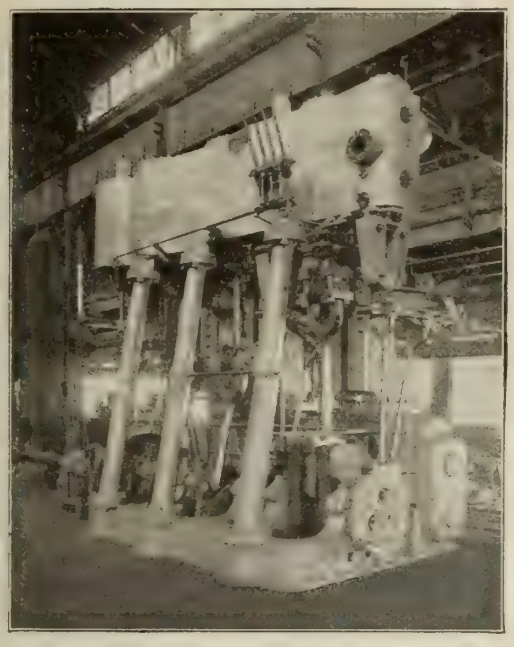
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Cylinders 21"- 33½"- 55½" x 42" stroke
with "built-in" type Condenser

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Capacities ranging from 200 H.P. to 4000 H.P.

With "built-in" or independent **CONDENSERS** Cast Iron or Steel Plate Shells

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Standard sizes designed within limits required for rail shipments.
Can furnish any size desired for water shipment to tide water.



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Auxiliary Condensers
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Marine News From Every Source

Vancouver, B.C.—The alleged refusal of the Coughlan Shipyards to reinstate a returned soldier caused 2,000 men to quit work.

The Port Arthur Shipbuilding Co. will build two more vessels of 4,250 tons each, which will have to come through the canals in two sections and be joined together at Montreal or Quebec. New Glasgow gets two ships of 2,800 tons each, which will be built by the Nova Scotia Steel Co., specially designed for the West Indian trade.

Ottawa.—The Marine Department has closed further contracts for six steel vessels. Two vessels of 8,100 tons each will be built by John L. Mullen Construction Co. of Prince Rupert, B.C., a Pittsburgh concern, which has leased its drydock and shipbuilding facilities from the Grand Trunk Pacific, and contemplates carrying on extensive work at that port.

Ottawa.—Referring to the statements made in connection with the loss of the "Princess Sophia" in Alaskan waters, that the salvage laws prohibited Canadian vessels performing salvage in American waters, and vice verse, Mr. A. Johnston, Deputy Minister of Marine, said this did not apply to saving human life. The laws applied only to the salving of wrecks, and not to rescue work from ships in distress.

Captain Purdy was, previous to the outbreak of the war, master of the Battle Line steamer "Pandosia," of St. John, which ship arrived at Hamburg just a day or so prior to the declaration of war. Within two or three days after the declaration Captain Purdy and his first officer, Captain S. S. Patterson, of Port La Tour, N.S., were with many others taken prisoners, and have ever since been held as such, although several at one time or another have been exchanged.

New Marine Equipment Shop.—Wm. Kennedy and Sons, Ltd., of Owen Sound, have nearly completed a large addition to their factory. The new building is 50 feet by 100 feet in the ground area, and about 33 feet high. It is well built, steel and concrete construction being employed, and will be equipped with an electric travelling crane of 20 tons capacity. The shop will be used as an erecting shop for marine machinery, which the company are manufacturing.

London, Eng.—Records in shipbuilding continue to pile up. Messrs. Harland & Wolff, Belfast, put the engines and boilers in a standard 6,000 ton oil carrier in one day, and expect to complete the fitting out in four weeks. Another record is in course of being made, another of this type of vessel having been laid down to be completed within 21 weeks. On the Tyne, the first of the new fabricated ships with a capacity of 10,500 tons on 28 feet 3 inches draught was launched in five months from laying the keel, notwithstanding delays caused by holidays and an influenza epidemic.

Quebec.—The American Shipping Board officials, who have been in Quebec all summer looking after the rejoining of ships for the United States Shipping Board, which had been cut in two for coming down from the lakes, are expecting to remain in Quebec for the winter. They were expecting five ships down from Montreal, which would be placed in the dry dock at Lauzon, There were three vessels in the Levis dock being put together, each of 4,800 tons, two of which, after inspection, left dock and proceeded for Sydney, N.S.

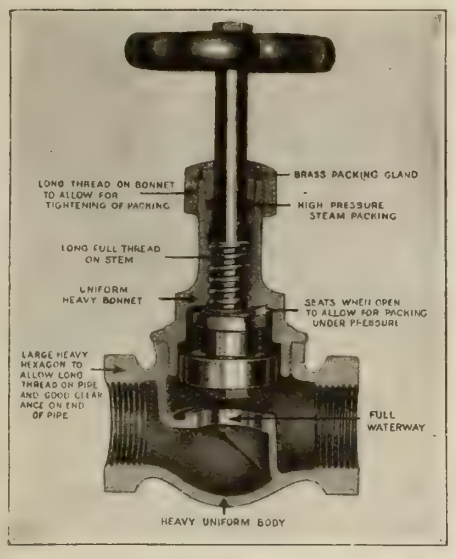
Toronto—Attention is being given in many quarters to the difference in cost of building ships on this continent and those built in Great Britain and Europe. This is not a new condition, but one which has prevailed for many years, and is the principal reason why the United States and Canada have in the past had practically no mercantile marine. Another feature is the higher cost of operating ships which are registered in Canada or the United States, particularly the States, and thirdly the enormously inflated cost of overhauling and repairs on this side over those prevailing in Europe.

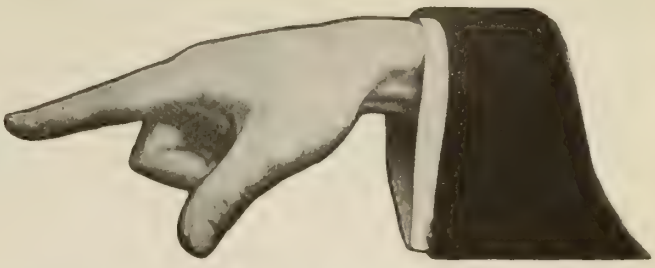
Sault Ste. Marie.—The report of the United States engineers shows a marked decrease in the amount of traffic passing through the canals here during 1918 The total movement of freight of all kinds amounted to 85,680,327 short tons, the lightest movement since 1914. Wheat shipments totalled 122,718,146 bushels, and grain other than wheat 30,000,621 bushels. The volume of flour handled was 8,228,844 barrels. Coal shipments came to 17,981,510 tons, of which 15,770,560 was bituminous. Iron ore shipments totalled 60,551,296 tons, and copper ore 86,078 tons. The amount of copper shiped was the lightest since 1913.

Detroit.—The project of making a deep waterway from the Great Lakes to the St. Lawrence and Atlantic Ocean has been brought again. A resolution was introduced into Congress by Senator Townsend of Michigan recently, for an investigation of a deep water project which would allow ships of deep draught to enter the harbors of Duluth, Chicago. Milwaukee and other Great Lake ports, after direct passage from Atlantic ports of this and other countries. Several American and Canadian Great Lake ports are taking up the idea with eagerness, and many engineers think the scheme quite feasible. This would give the shortest route to Europe and eliminate the rail haul so much in use now, with its attendant troubles of transhipment.

New York.—The advantage of having all the shipping of the country under one management, according to information given out by the Federal Shipping Board, has resulted in bringing all of the lake coal and ore steamers to the seaboard for service during the time they would be frozen up and useless if left on the Great Lakes. This is expected to release all the steam tonnage now engaged in the coastwise coal trades for overseas trips, if needs be. It is understood that all the Dutch ships now engaged in coastal trade will be transferred to the United States flag and converted into carriers of coal, oil or nitrates, and the lake steamers will take their places in the coastwise coal business. The lake season will close about the middle of October, when the boats will be brought down to the Atlantic. How much this programme will improve present tonnage business, only time can tell.

Vancouver.—A very interesting legal tangle will soon be unravelled in the British Columbia courts arising out of the salving of the big Japanese liner S.S. Canada Maru, which ran on the rocks at Cape Flattery, July 29th. Powell Davies of Montreal last July purchased from the B. C. Salvage Company the S. S. Salvor for $250,000, that same day making his initial payment of $50,000 and was given a receipt for that amount, the salvage company undertaking to turn over the bill of sale for the vessel when the balance was paid. Mr. Davies left for Vancouver to complete his financial arrangements and in the meantime word came to the salvage company advising that the Canada Maru was on the rocks, so they immediately dispatched the Salvor to the wreck. Mr. Davies returned to Victoria, made his final payment and received his bill of sale. Two days later the Canada Maru, valued at two million, along with a four million dollar cargo of silk, etc., came limping into port in tow of the Salvor. Now the interesting question is who is to get the salvage money.





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EMCO Globe Valves are fitted with metal packing gland, and are complete in every detail. Every valve is packed with high-grade packing before it leaves the factory. This is only one of the many new lines we have made recently to fill some long-felt wants for high-grade valves.

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ADMIRALTY COURT REPORTS

Continued from page 60

that he was 47 years of age, produced his Board of Trade Certificate as Master of a foreign going ship, No. 043,503, that he had been in command five years, that the "Siberian Prince" was a steel built vessel of 5,604 tons gross and 3,582 net, official number 135,729, owned by the Prince Line, Newcastle-on-Tyne, carrying a crew of 47 all told, including gunners, four certificated officers and four engineers, her length being 437 feet, breadth 56 feet, and draught at the time of the casualty 25 feet aft and 23 feet 2 inches forward, single screw, triple expansion engines, and was well supplied with Admiralty Charts, sailing directions furnished by the Admiralty, and compasses, the standard one being a Lord Kelvin Type adjusted the previous voyage and being practically magnetic.

He left Newport News June 25th, bound for Halifax, with special instructions to be there one day before the convoy was due to start; experienced dirty weather and had only one observation on the 28th, there being thick fog, and at times rainy weather.

On the 28th he found himself a little north of his assumed position. He had never been on the Nova Scotia Coast before. He did not sight any land until the stranding. He had made for a whistling buoy, but was advised that the buoy was adrift. At 7.30 on the 29th he put a telegraph at standby, and engines at half speed, took a cast of the lead, obtaining 23 fathoms, it then being thick fog. He took five casts of the lead, but the result did not correspond with his course, and he intended then to anchor. At 7.30 he began to take soundings, and at 8.55 the ship grounded at Egg Islet. At about 9 o'clock he received a message that the buoy was adrift, but the ship was ashore. The ship had been kept at half speed, about six knots an hour. The third officer was on watch, a lookout was at his post in the crow's nest, and the whistle was in operation. He kept half-speed notwithstanding the fact that the soundings showed that they did not coincide with his dead reckoning, and placed him ahead some eight miles, because of reports of the presence of submarines he did not wish to remain outside. When eight fathoms were obtained the ship was still going half speed, when a patch appeared ahead, the engines were put full speed astern. When the ship grounded a small kedge was run out; but it came home, therefore being ineffective. With the rising of tide the ship changed position and grounded on the opposite side. No attempt was made to haul the vessel, other than the laying of a small kedge and working the engines astern. Naval authorities jettisoned some cases of cigarettes and hogsheads of tobacco, and a tug boat came to the scene, but went away without rendering any assistance.

Owen E. Jones, Third Officer, holding certificate as Second Mate of Foreign Going Steamships Only, No. 0010981, deposed that there were four or five degrees deviation on the standard compass; also claimed the vessel was going about four knots, and that he had obtained ten fathoms with the hand lead, which was used in preference to the sounding machine, as casts could be obtained more expeditiously. The rest of his evidence was a corroboration of the Master's.

Donald Shaw, Chief Officer; Harry Laws, Fourth Engineer; William Holmes, Wheelsman, and William Burrows, Lookout, were sworn and deposed; but their evidence did not throw any further light on this matter, and the Court adjourned to render a finding.

Re SS. "SIBERIAN PRINCE" STRANDING: FINDING

The evidence adduced, chiefly that of the Master, has been carefully reviewed and weighed, and analyzing its various phases the Court finds, 1st, that whilst the Master, Hector Alexander Camp, No. 043,503, has taken casts at different times from 7.40 until the ship stranded, when he had determined to anchor in shoal water, and seeing the depth decreasing from 23 fathoms to 10 fathoms, he should, at this last sounding, have stopped ship, anchored or awaited developments. The sea was practically calm, while the wind experienced was discounted as to its influence on the vessel. Instead he continued at half speed, six knots, though the Third Officer said it was about four knots.

At any rate the Court considers that to continue on after the last sounding was a thoughtless action.

2nd. When the vessel grounded, or at least touched her port side to a bank, it is evidence that after the use of a kedge which proved ineffective, there was no show of seamanship on the part of the Master to extricate the ship from her position, which the Court opines could have been done, and which, even if unsuccessful, would have shown at least some serious and practical attempt to extricate the vessel from the bank. She had plenty of water all along on her starboard side as shown by the soundings. The laying of a heavier anchor from the starboard quarter, and from the starboard bow, which could have been effected under the existing conditions of weather, as there were sufficient men on board to execute such work. After tightening on both cables the coming high tide would have released the vessel in the view of the Court, based on the evidence.

3rd. When she began to swing her stern fell free, and before she was, by wind and tide, and perhaps by the existing swell, pressed towards the bank on the starboard side, nothing appears, from the evidence, to have been done, either by working the engines full speed astern, or laying an anchor, to check the swinging.

It is fortunate that the vessel has rested on soft bottom, practically sheltered, as she has suffered apparently no damage, and is again in port in readiness to take the most of her cargo.

The Master has, since the beginning of the war, been in constant active service, experiencing at one time heavy shell fire from a submarine for nearly two hours, and on another instance, by quick manoeuvring of his vessel, avoided being struck by a torpedo.

These facts being taken into consideration by the Court it will not deal with his certificate, yet finds him in default and reprimands him severely for lack of prudence. He is also found wanting in exercising the seamanship required by a Master in such instances. The Court is of opinion that if a little resourcefulness had been exercised the ship could have been floated off the next day.

The Third Officer who was on duty, also the First Officer, who was on duty, are exonerated.

At such a moment it does appear to the Court that at least one Officer should have been on the bridge with the Master to attend to the telegraph and steering.

While First Officer Shaw is exonerated, the Court feels that he showed in some respects a lack of loyalty and was lukewarm in meeting his responsibilities. The Master was a stranger in these waters whilst he, the First Officer, had already frequented the neighborhood, in view of which it does seem strange that he did not volunteer some suggestions when the ship came in shoal waters; also have advised as to other means to get the ship off when the kedge anchor failed to meet expectations. He is hereby cautioned to wake up to his responsibilities.

The Court will not advance the theory that there was carelessness shown; but there is nothing in the evidence of the Master indicating other than bad judgment and lack of proper seamanship.

The Certificates of the Master and Third Officer are returned herewith.

Dated at Halifax, N.S., this 22nd July, 1918.

(Signed) L. A. DEMERS,
Dominion Wreck Commissioner.

Concurred in by
(Signed) G. H. BRIDGE,
Commander R. N. R.
(Signed) C. J. STUART,
Commander R. N. R.
Nautical Assessors.

SHIPBUILDING ACTIVE

Activity in shipbuilding in and about Montreal is still continued, but the operations have shown a slight easing off since the signing of the armistice. Night work has been discontinued in some yards and reduced in others. Early in the month Canadian Vickers successfully launched the "Canadian Pioneer," the first of the fleet of Canadian Government steamers now being constructed. A description of this event is given elsewhere. Fraser Brace Co. are making good progress on the eight wooden vessels for the French Government. It was expected that the first one would be ready for launching about the middle of January, and that the same would be done by breaking the ice in the basin and canals, but with the present weather continuing the ice-breaking may not be necessary.

It has been announced that six more steel vessels have been contracted for by the Marine Department. Two of these are to be built by the Mullen Construction Co., a Pittsburgh firm, which has leased from the G.T.P. its dry dock and shipbuilding facilities at Prince Rupert. Two of the other boats go to the Port Arthur Shipbuilding Co., and the remaining two to the Nova Scotia Steel Co. These last two are of 2,800 tons and especially designed for service in West Indies ports, where larger vessels cannot enter.

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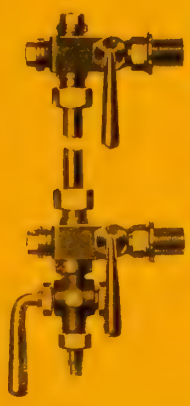




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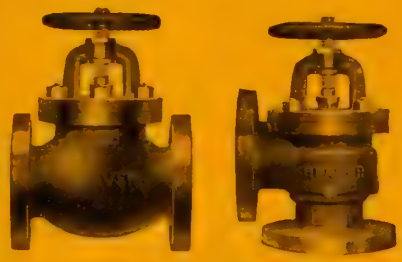
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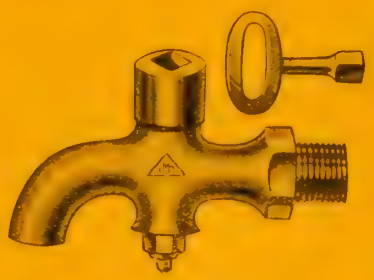




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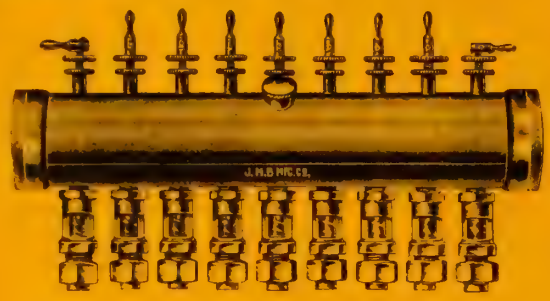


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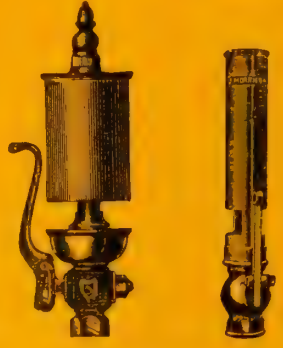
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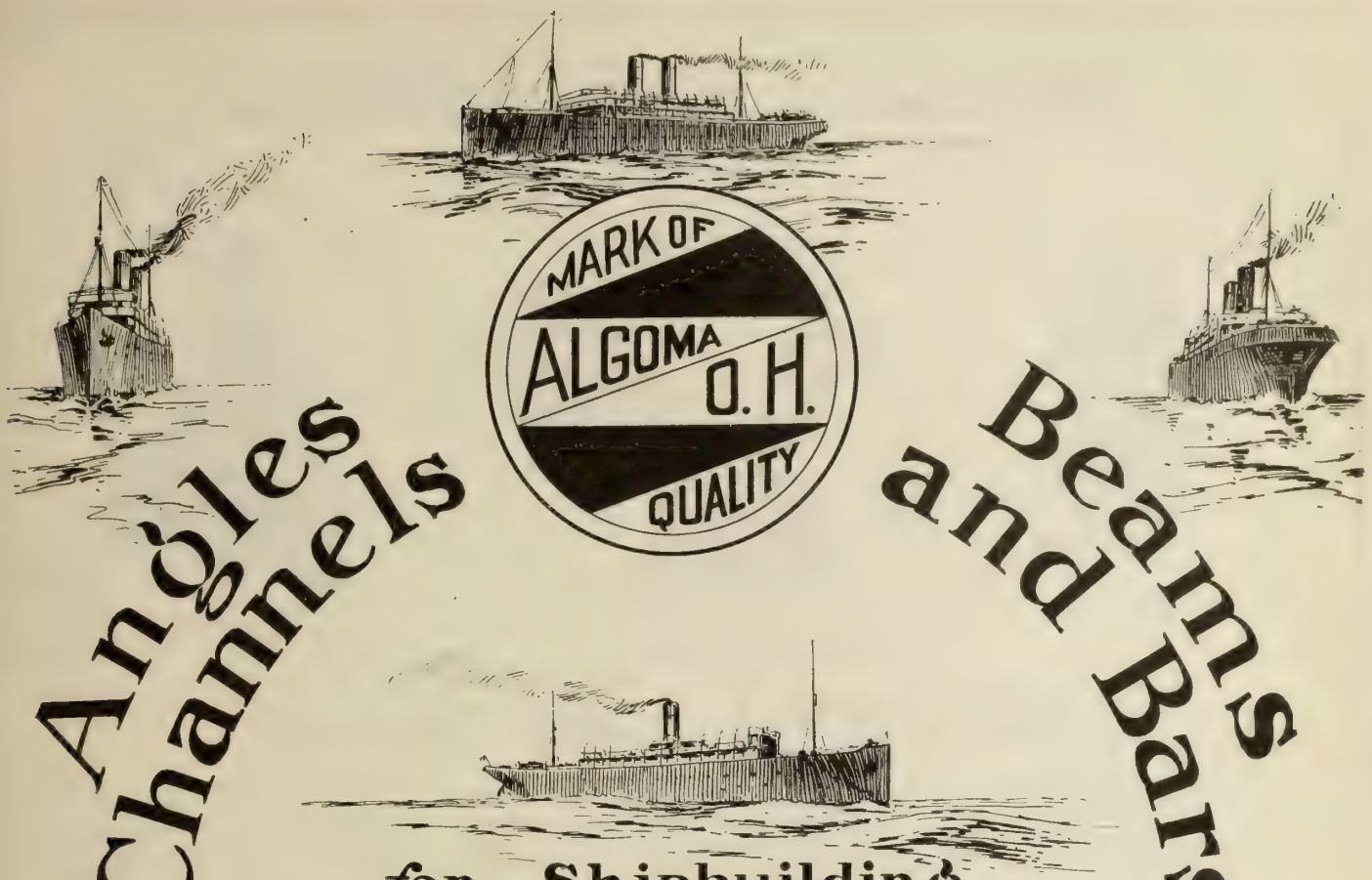
WHISTLES

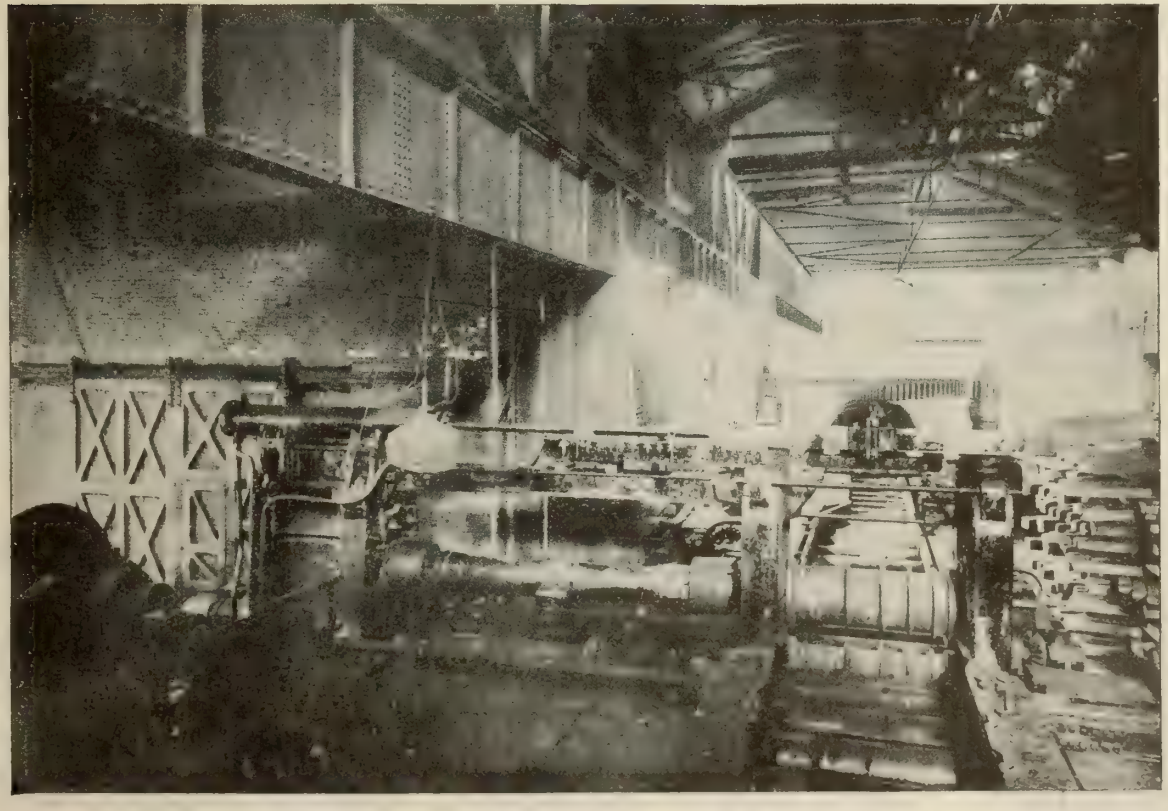




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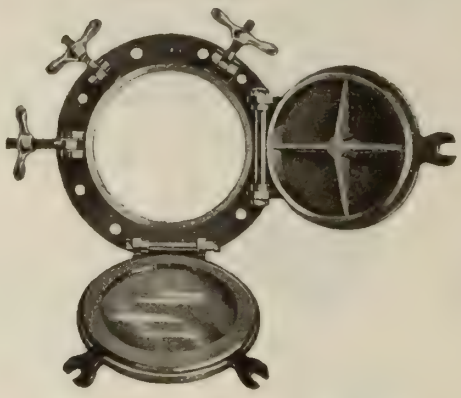
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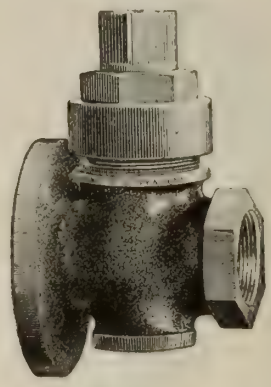
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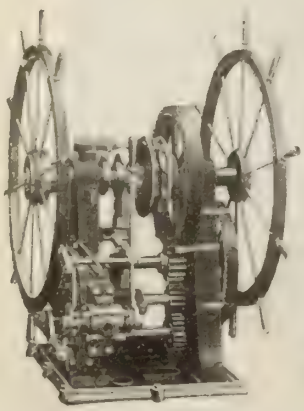
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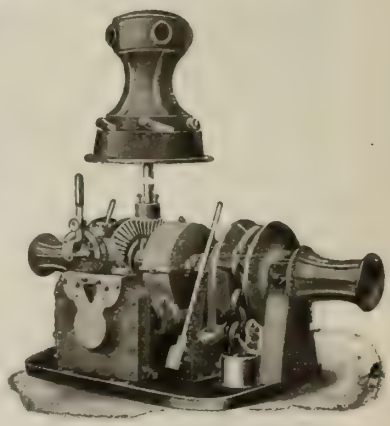


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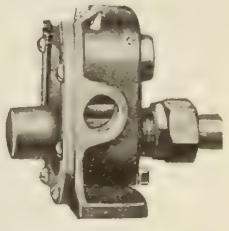
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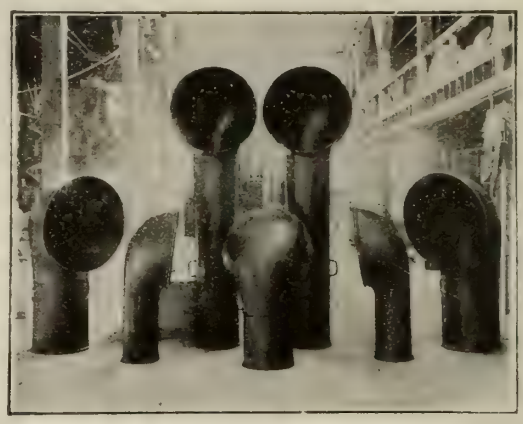
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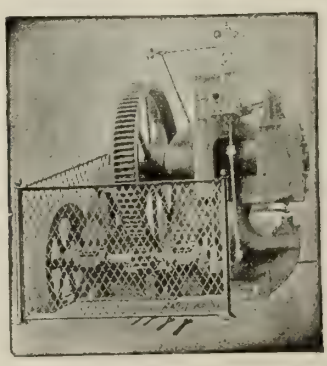
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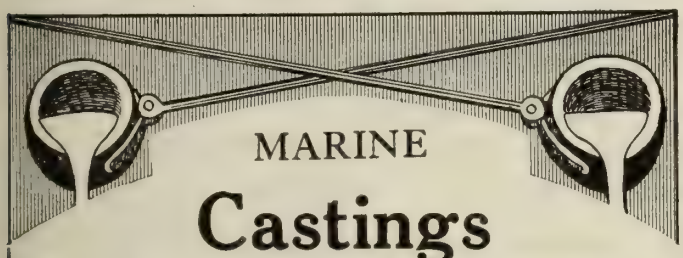
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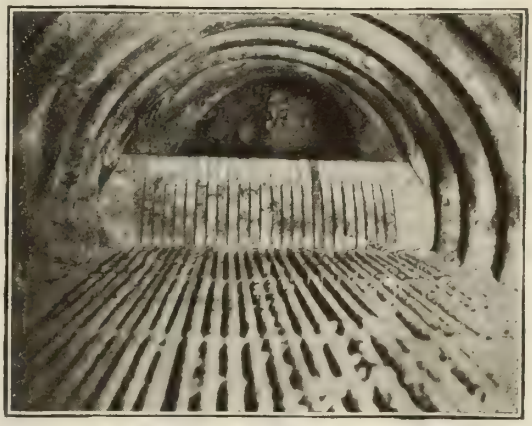
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THE "NEW" MACLEAN'S

Starting with the January issue, MACLEAN'S MAGAZINE comes out in a new size—11 x 14¼—same size as *The Saturday Evening Post.* This change will enable us to give readers more entertaining articles and stories, and a very much enlarged "Review of Reviews" Section. You will find this January issue of MACLEAN'S more pleasing and instructive than the great majority of magazines you find displayed on news-stands—and

contents are carefully censored—no sex stories—you can take it into your home with the utmost confidence.

A word about the contents—

"Why Laurier Will Wait"

In discussing the policy of the Liberal leader during the coming session of Parliament, J. K. Munro predicts, in January MACLEAN'S, that Laurier will allow Union Government a free hand. In this policy of inactivity "he sees the way open to the accomplishment of all his purposes. If he is half the politician his friends believe he is, he will sit and smile and wait—yet a little longer."

All Canada is interested in what is going to happen in Ottawa. J. K. Munro, veteran press gallery man, is a shrewd observer, and his political articles in MACLEAN'S have stirred up more comment than anything else appearing in the press of the country. He knows politics from the inside. "Why Laurier Will Wait" is a forecast of the near future that bristles with interesting points. A few of the other "head-liners" in this issue:

Bolsheviks at Work in Canada
A sensational article on activities in subterranean circles. There are foreigners in Canada ready to wave the red flag.

Achievements of the Canadian Army
Since the Canadian Division was formed, they have not retired a foot nor lost a gun—a marvellous record. An inside story of how this great army was handled and controlled is told by H. F. Gadsby who spent a month at Headquarters during the last great offensive.

The Grave Dangers of Peace
An article by Agnes C. Laut on the insidious new propaganda being launched by the Germans to split the Allies.

Jock in a Juggernaut
The most interesting war article in a long while, because it is new—it deals with experiences in the tanks.

AND THESE AS WELL:

The Dance Halls of Dawson - By E. Ward Smith

My Hour - - - - By Robert W. Service

The Strange Adventure of a Rialto Rainstorm - By Arthur Stringer

The Minx Goes to the Front - - - - By C. N. and A. M. Williamson

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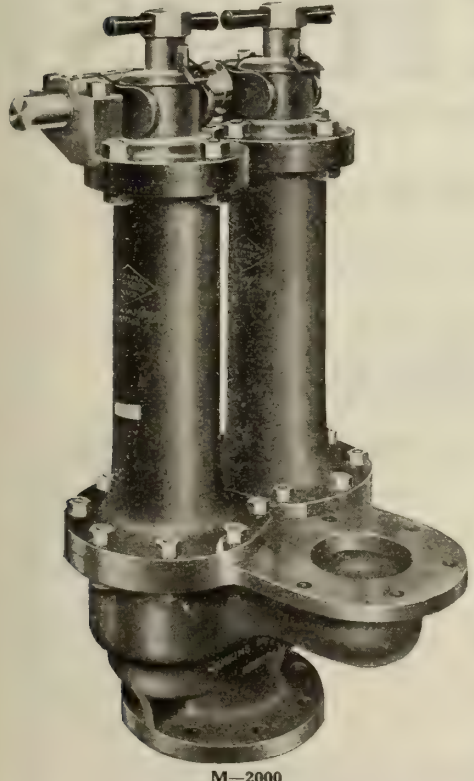
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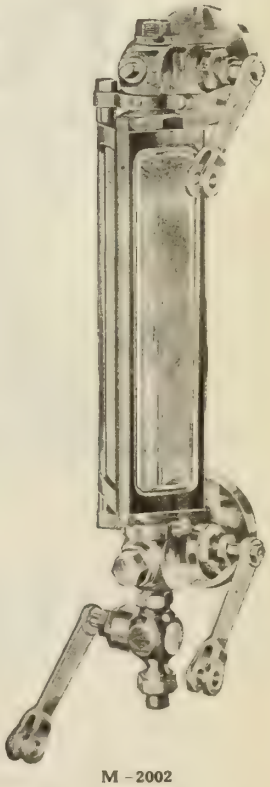
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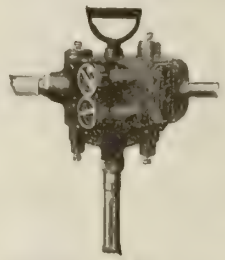
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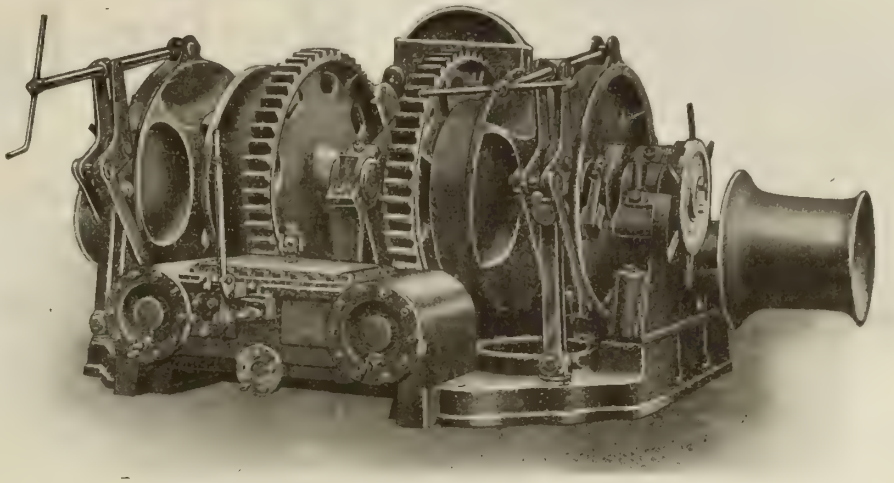
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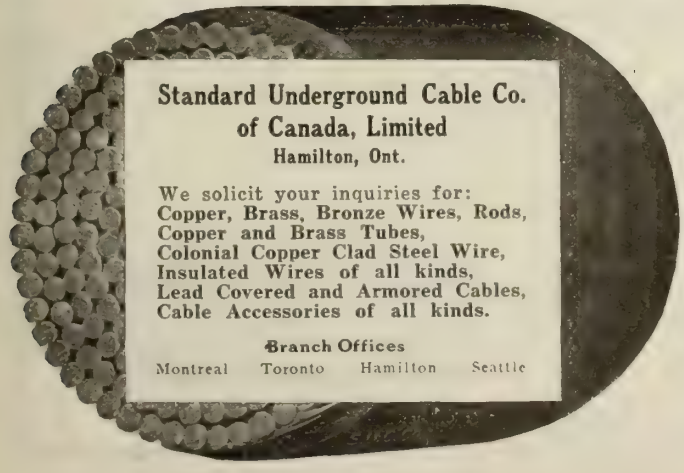
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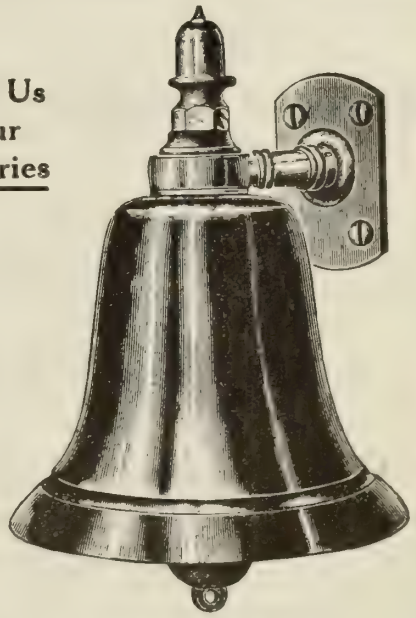


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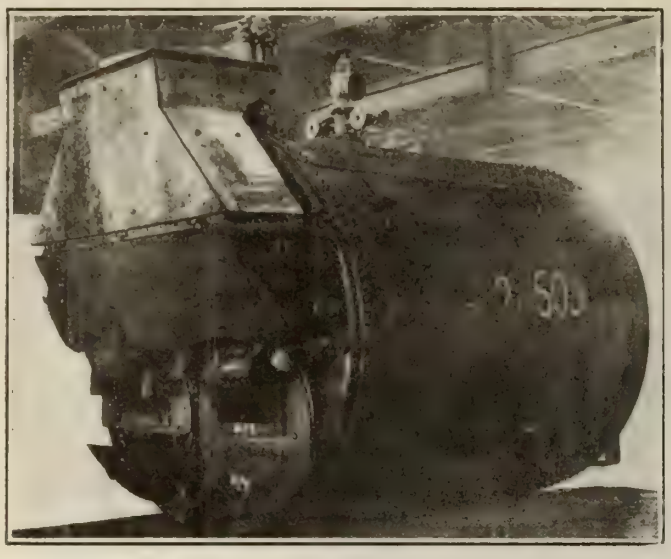


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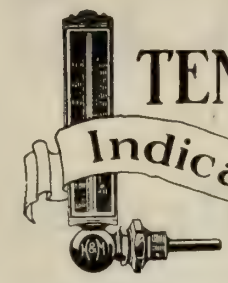
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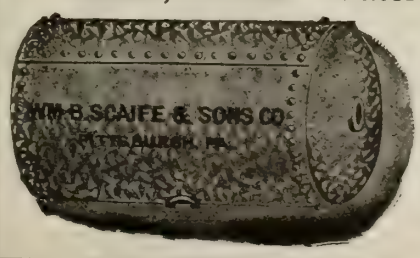
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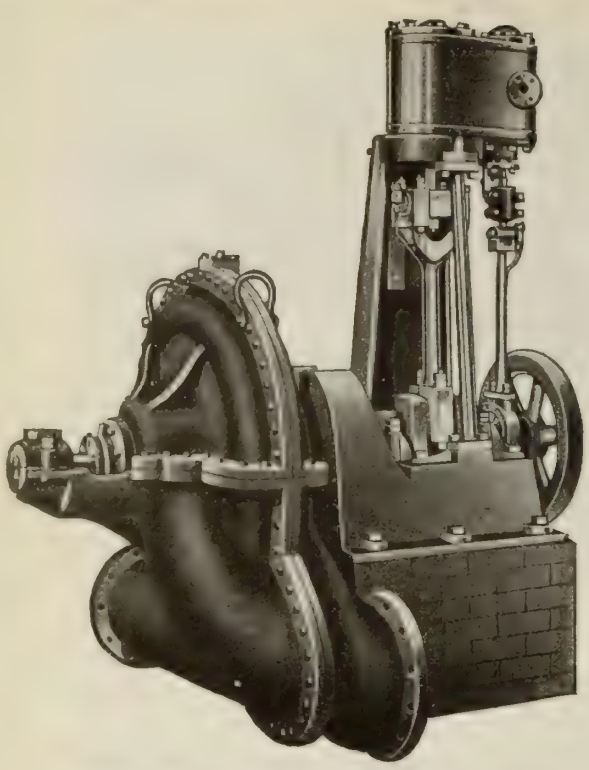
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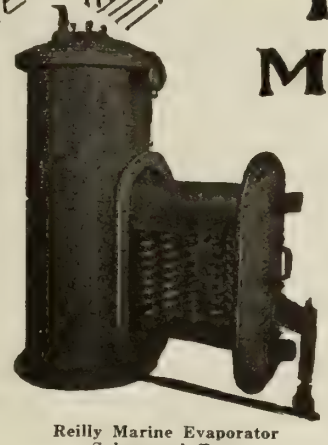
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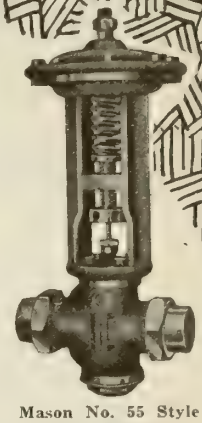
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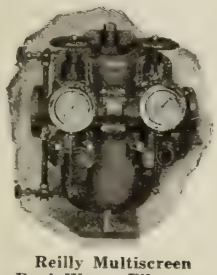


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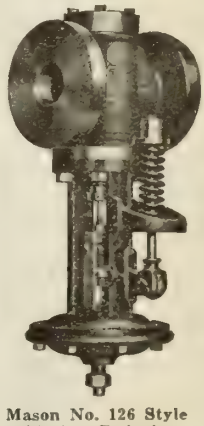
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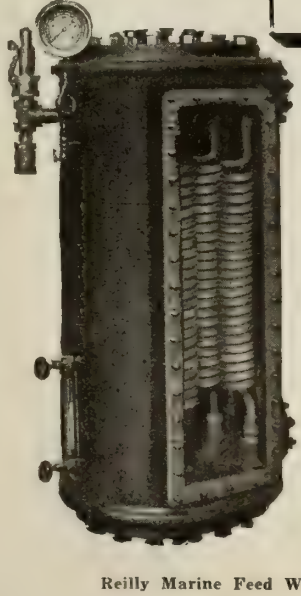
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We are reminded of a story. A railroad man, born in Canada, was revisiting his home town on the St. Lawrence River. He wandered up to a group of old-timers who sat in the sun basking in blissful idleness. "Charlie," said one of the old men, "they tell me you are getting $20,000 a year," "Something like that," said Charlie. "Well, all I've got to say, Charlie, is that you're not worth it."

A salary of $20,000 a year to these do-nothing men was incredible. Not one of the group had ever made as much as $2,000 a year, and each man in the company felt that he was a mighty good man.

Charlie had left the old home town when he was a lad. He had got into the mill of bigger things. He developed to be a good man, a better man, the best man for certain work. His specialized education, joined to his own energy and labor sent him up, up, up. To put it in another way: Charlie had always more to sell, and the world wanted his merchandise—brain, skill and ability. Having more to sell all the time, he got more pay all the time.

Charlie could have stayed in the old home town; could have stagnated like others; could have been content with common wages. In short, Charlie could have stayed with the common crowd at the foot of the ladder. But Charlie improved himself and pushed himself, and this type of man the Goddess of Fortune likes to take by the hand and lead onward and upward. Almost any man can climb higher if he really wants to try. None but himself will hold him back. As a matter of fact, the world applauds and helps those who try to climb the ladder that reaches towards the stars.

The bank manager in an obscure branch in a village can get out of that bank surely and swiftly, if he makes it clear to his superiors that he is ready for larger service and a larger sphere. The humble retailer can burst the walls of his small store, just as Timothy Eaton did, if he gets the right idea and follows it. It is not a matter of brain or education so much as of purpose joined to energy and labor. The salesman or manager or bookkeeper or secretary can lift himself to a higher plane of service and rewards if he prepares himself diligently for larger work and pay. The small manufacturer, the company director, the broker—all can become enlarged in the nature of their enterprise and in the amount of their income—by resolutely setting themselves about the task of growing to be bigger-minded men.

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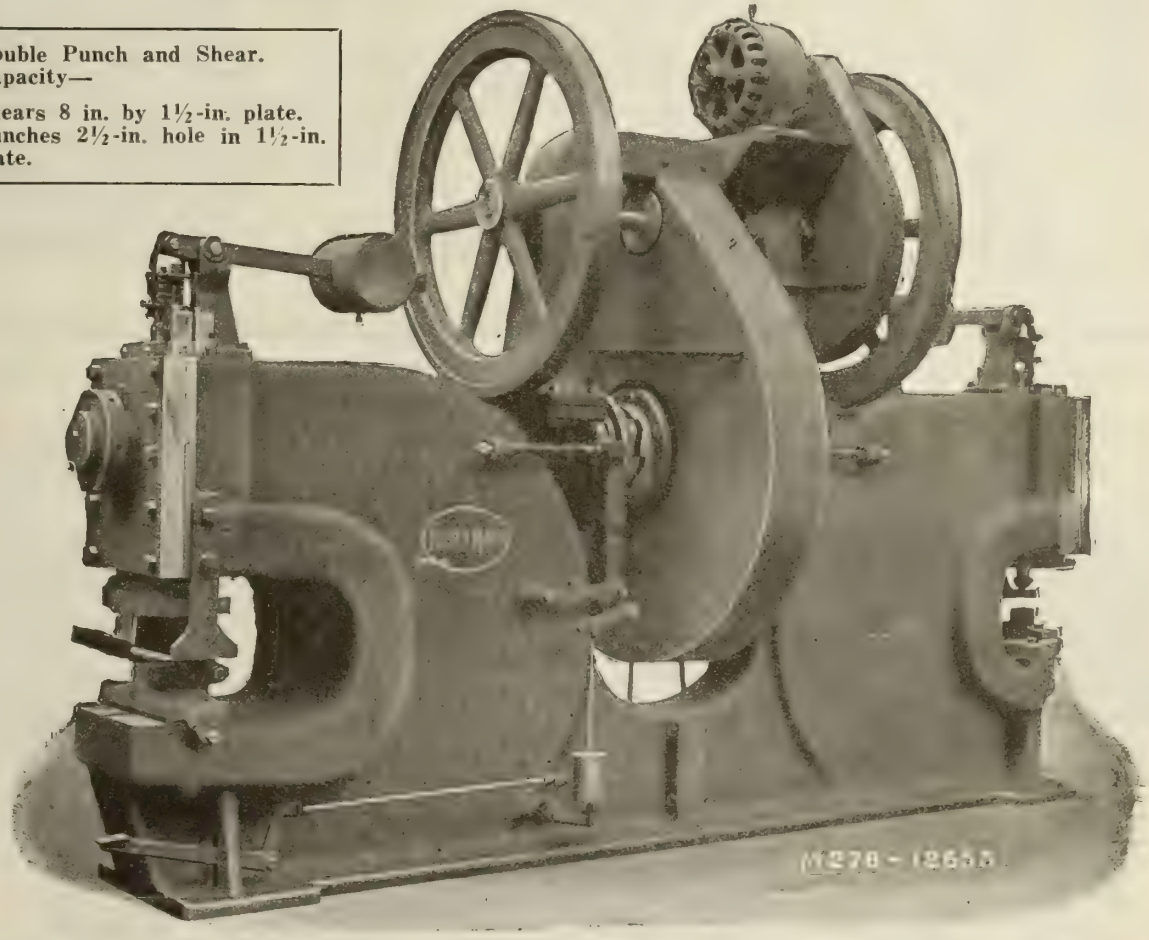
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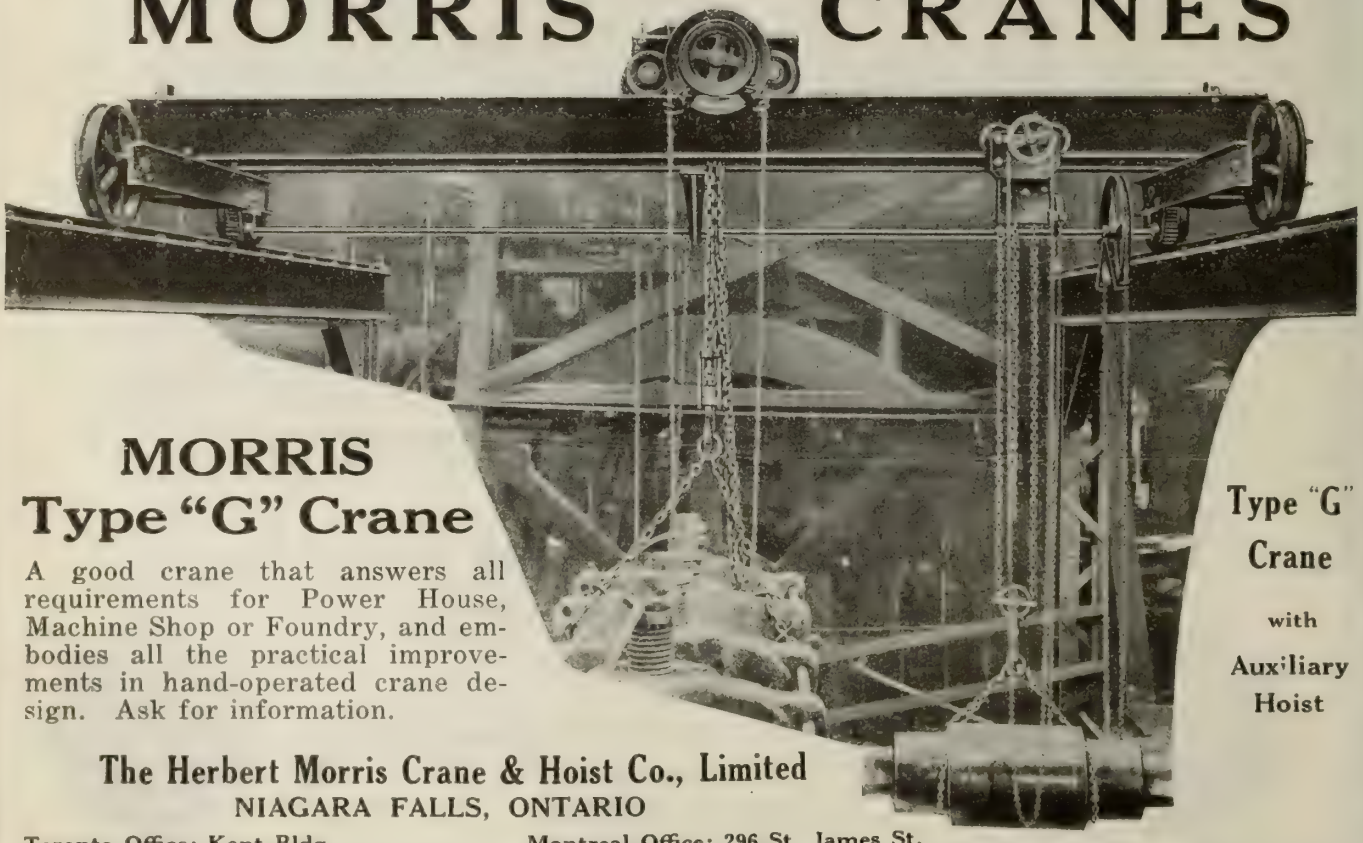
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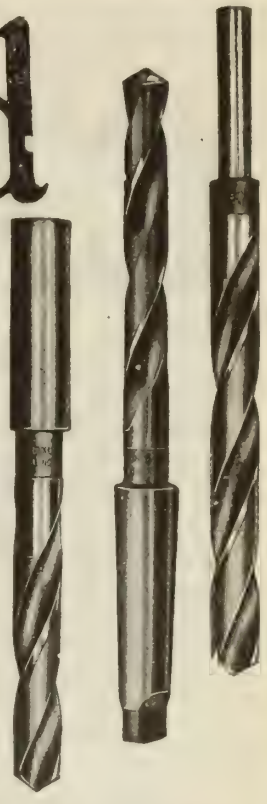
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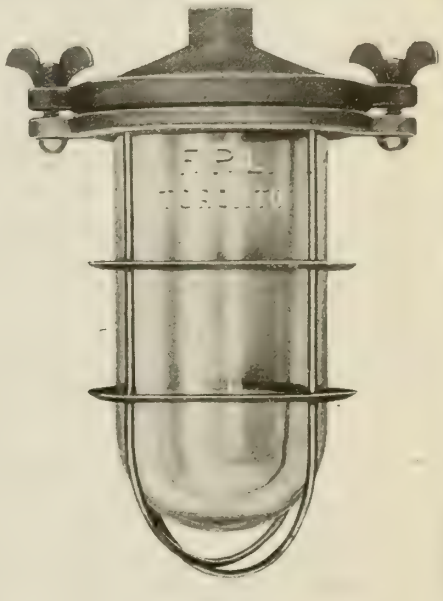
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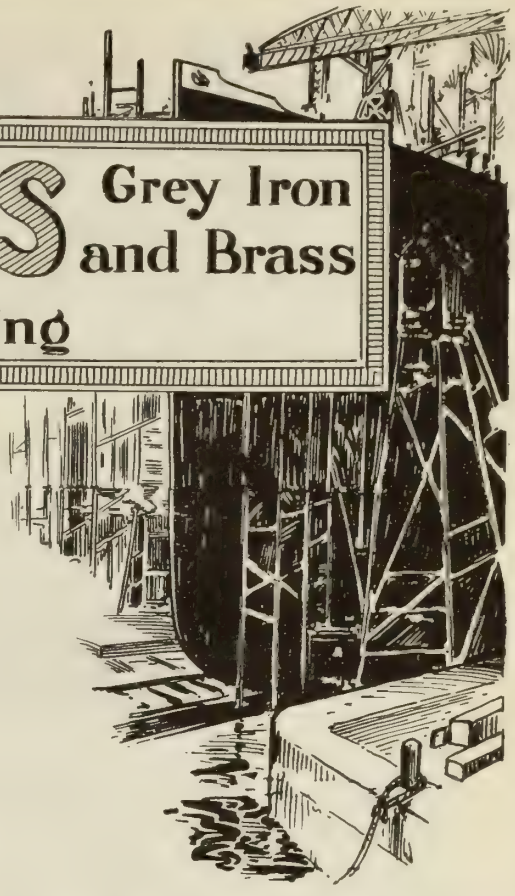
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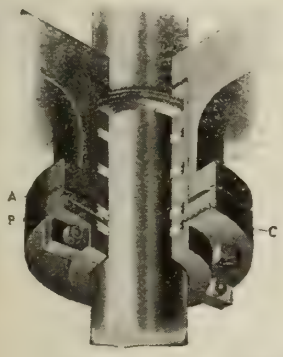
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By A. E. SEATON, M.I.C.E., M.I. Mech. E., M.I.N.A.

CONTENTS: General Introduction—Resistance of Ships and Indicated Horse-Power necessary for Speed—Marine Engines, their Types and Variations of Design—Steam used Expansively—Steam used after Expansion—Turbines—Sea Cocks and Valves—Auxiliary Machinery—Boilers, Fuel, &c., Evaporation—Tank Boiler Design and Detail—Boiler Mountings and Fittings—Fitting in of Machinery, Starting and Reversing of Engines, &c.—Weight and other Particulars of Machinery relating thereto—Effects of Weight—Inertia and Momentum—Balancing the same—Materials used by the Marine Engineer—Oil and Lubricants—Engine Friction—Tests and Trials: Their Objects and Methods—18 Appendices, including Diesel Oil Engines—Lloyd's Register Rules for Internal Combustion Engines, &c., &c.—Index.

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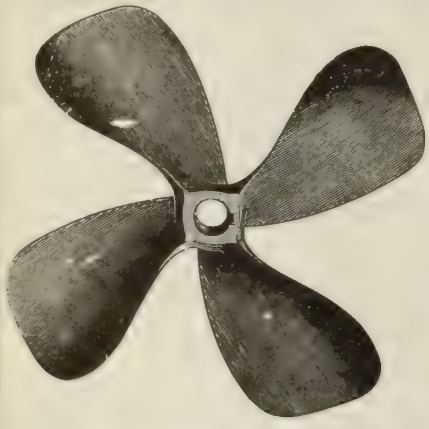
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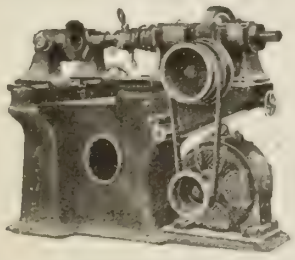
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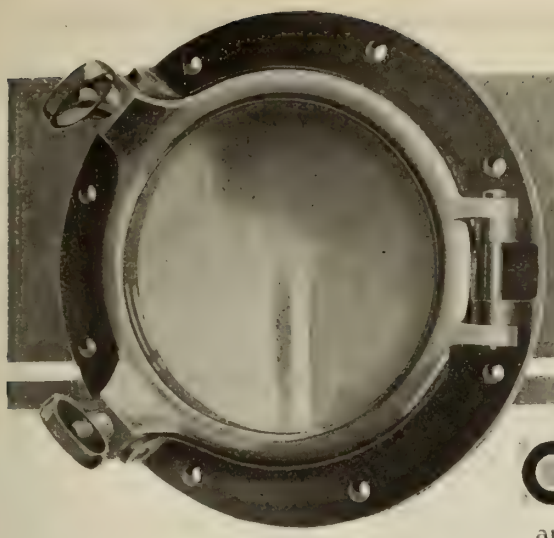
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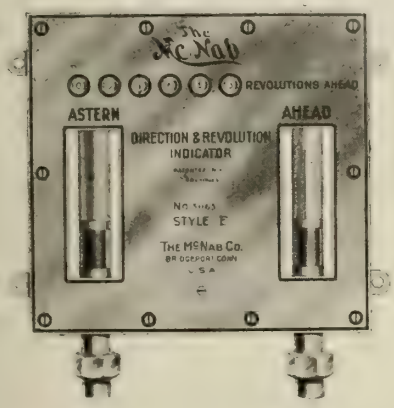
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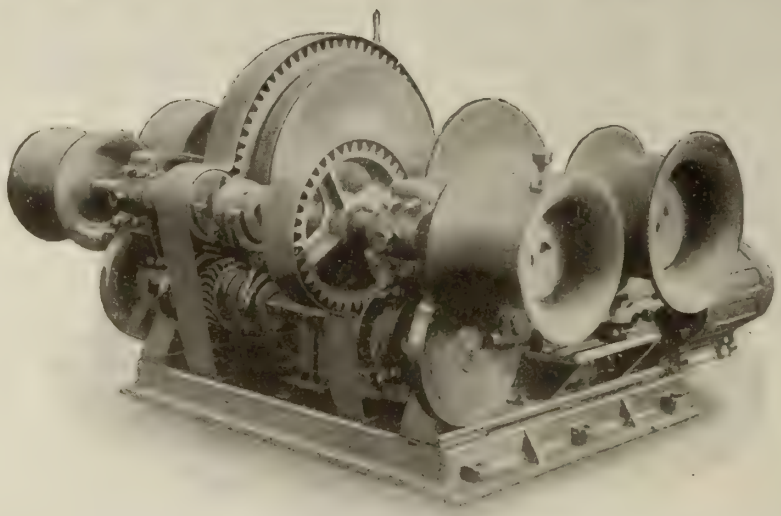
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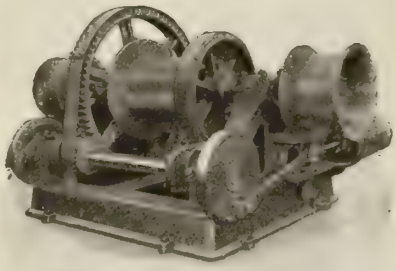
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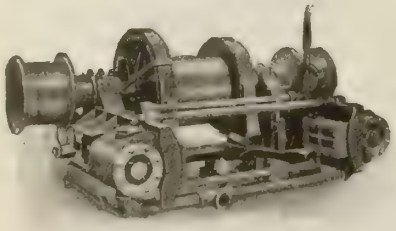
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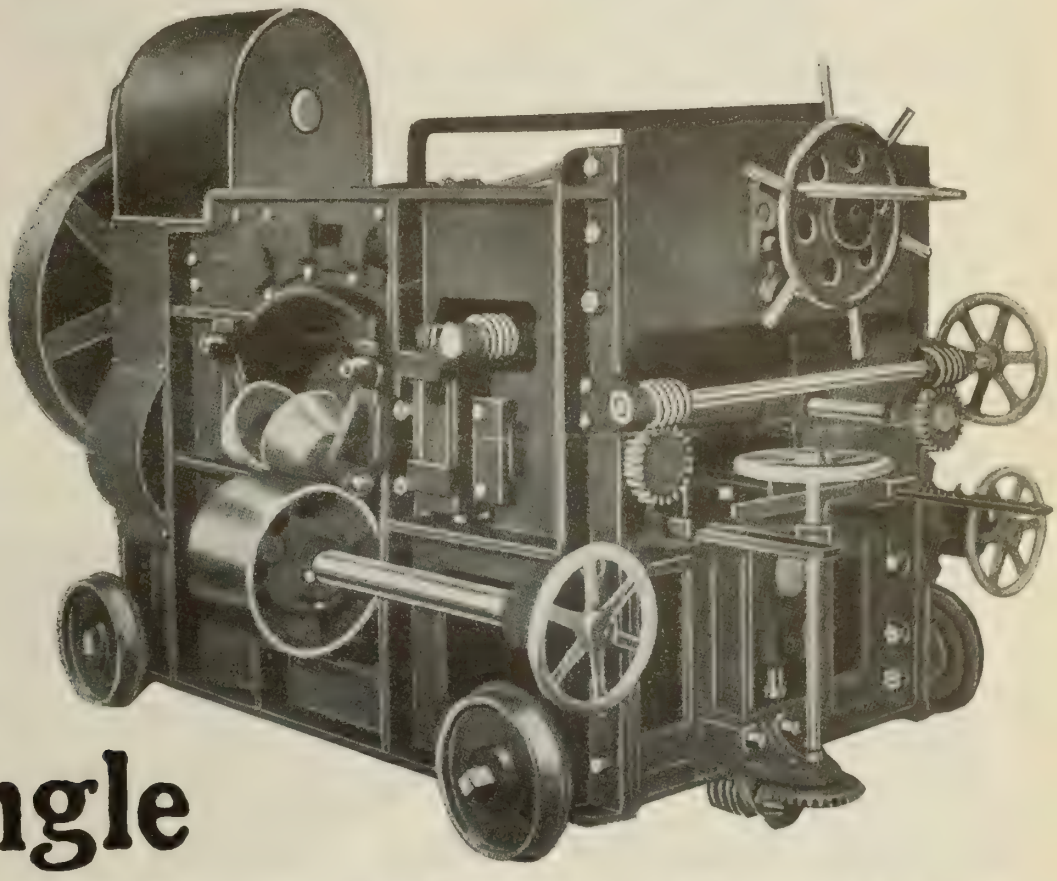
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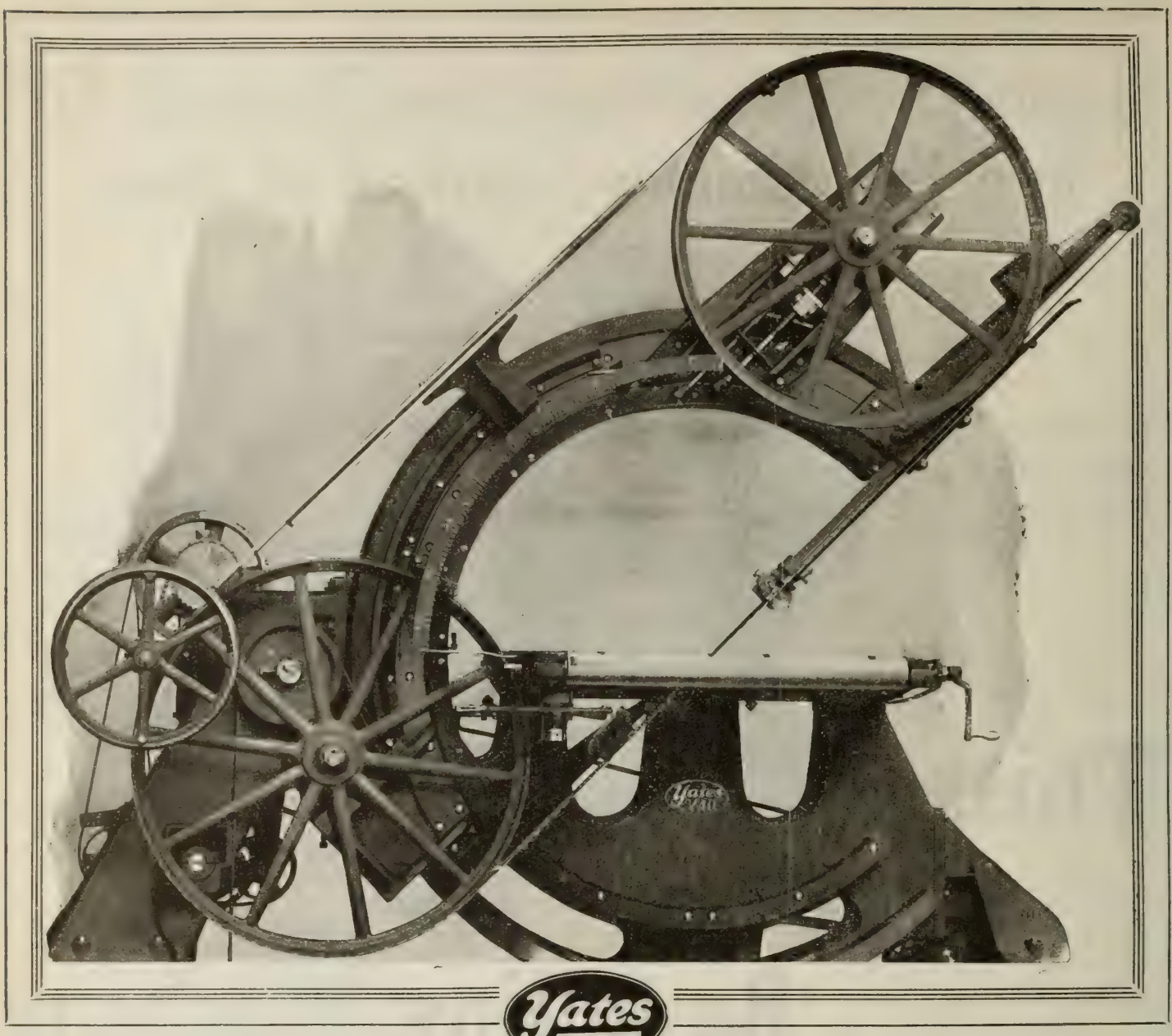
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Morris Crane & Hoist Co., Herbert, Niagara Falls, Ont.

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Norbom Engineering Co., Philadelphia, Pa.
Polson Iron Works, Toronto.

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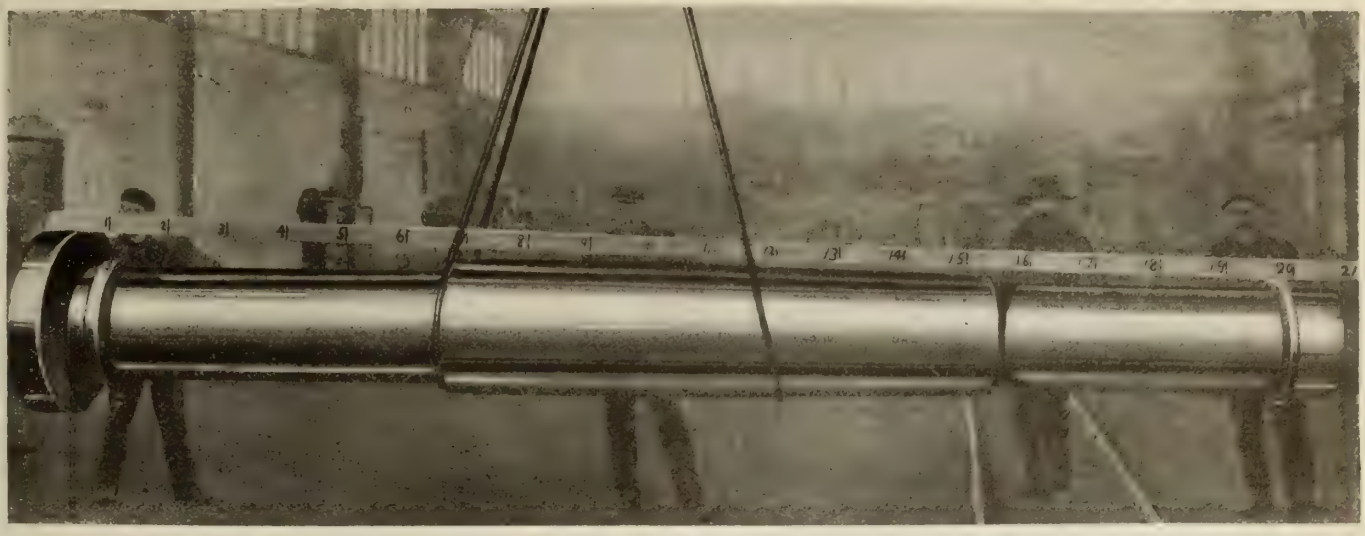
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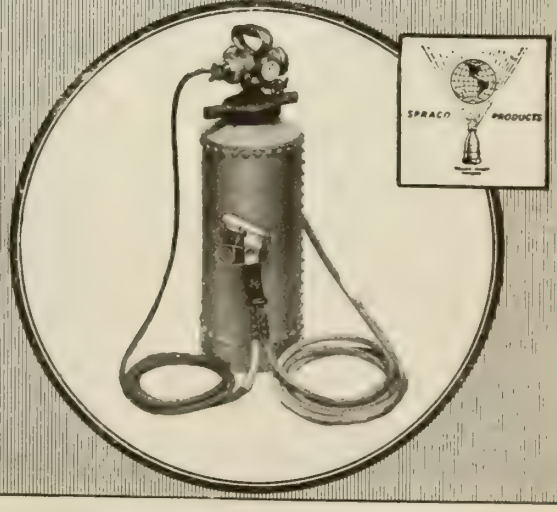


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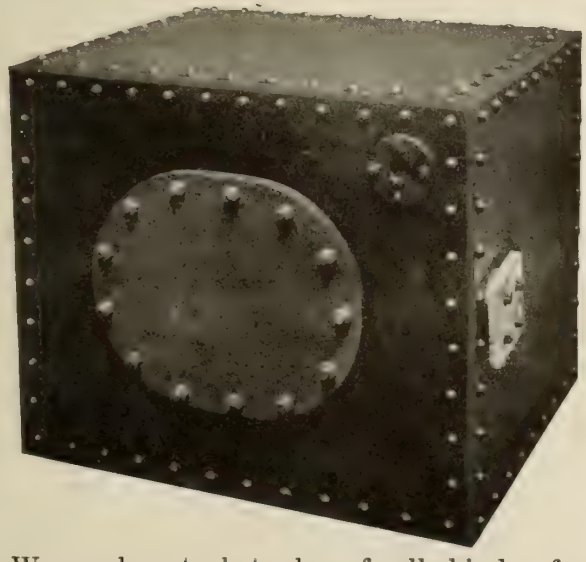
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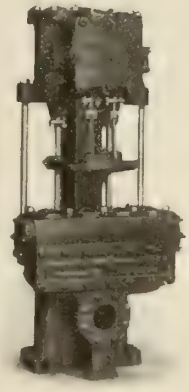


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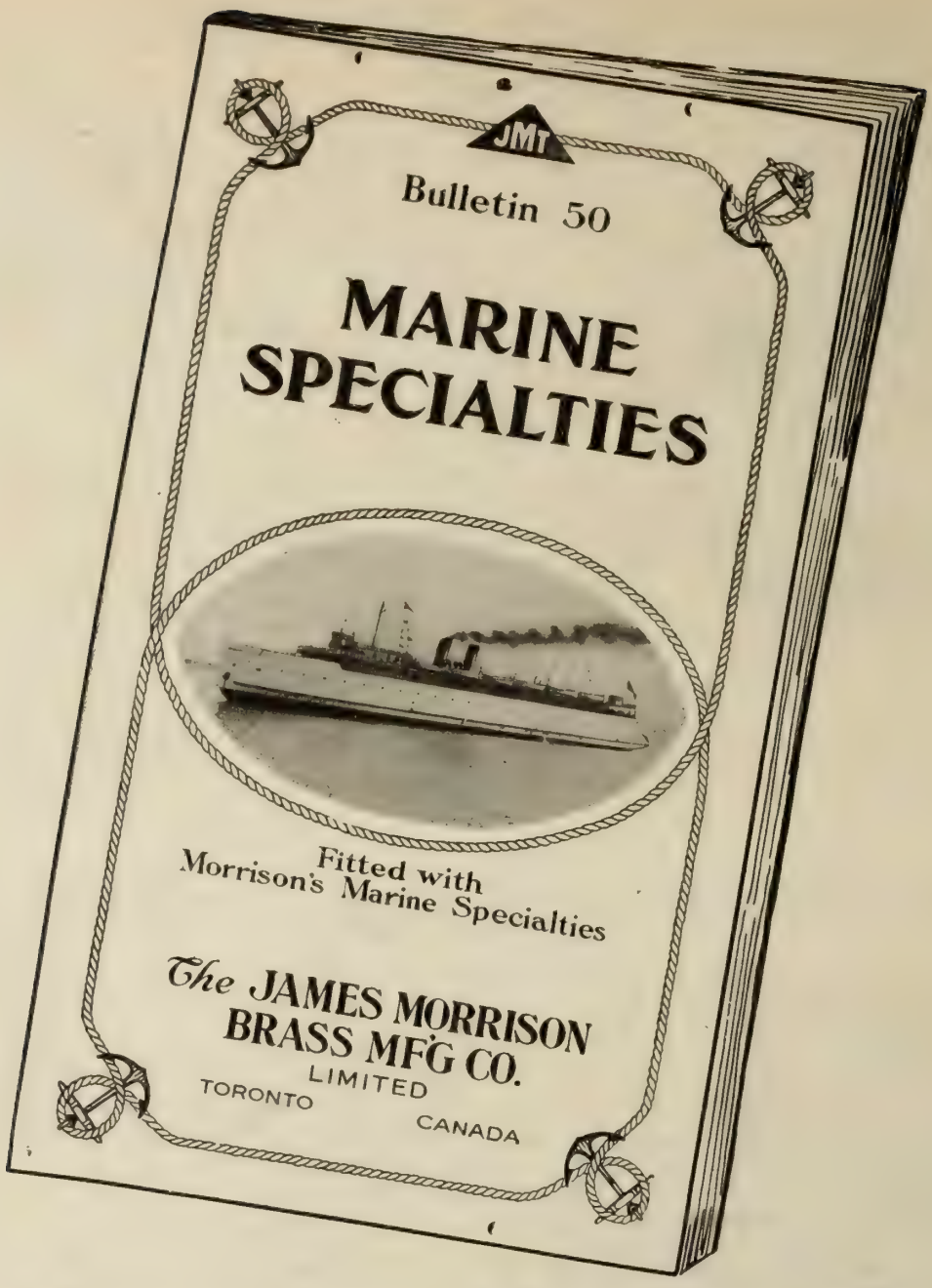
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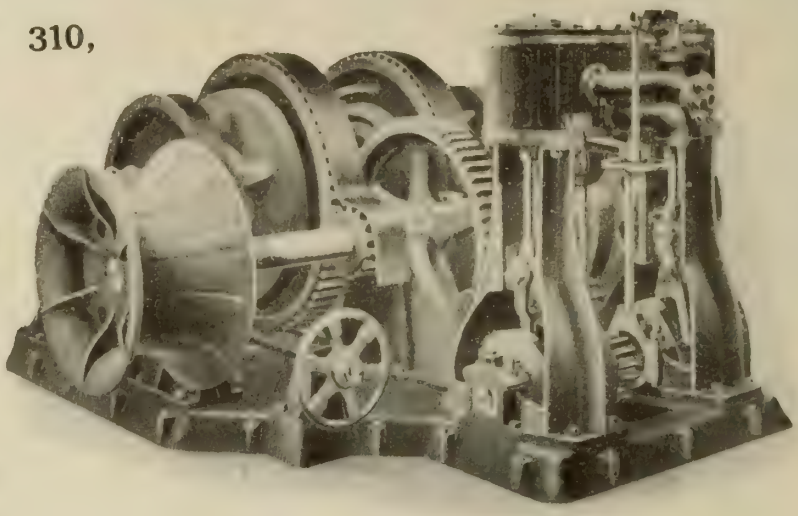
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Builders of Special Floating Oil Storage Tanks.

The Talbot Contra-Flow Steam Boilers

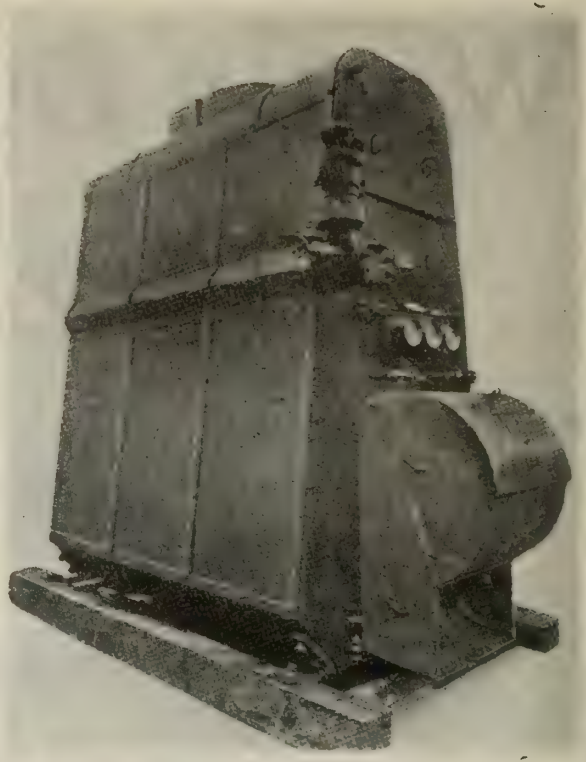
(Equipped with Crude Oil Burners)

and - -

Uni-Flow Engines

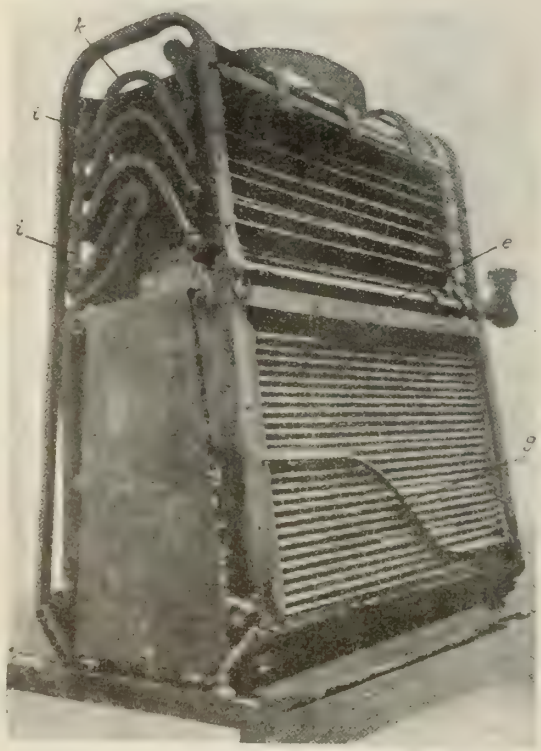
For Marine and Power Plants

Now Manufactured in Canada by the



Front of Boiler with Casing

Montreal General Tool Co., Limited



Rear of Boiler with Casing Removed

Write To-day for Full Particulars

The Talbot Contra-Flow Steam Boiler

The compact, lightweight, oil-burning Talbot Boiler has made the generation of steam so simple, **safe** and **cheap** that power plants and users of pleasure and commercial boats are able to obtain the **smooth-running, odorless** and **powerful** qualities of heavy-duty steam equipment, without boiler troubles, clutches, gears, fly wheels or danger. The boiler is non-explosive, and its control is automatic and positive.

The Uni-Flow Engine

The four-cylinder, double-acting, all-steel Talbot uniflow engine is controlled by two small levers located in any part of the engine room of power plant or boat.

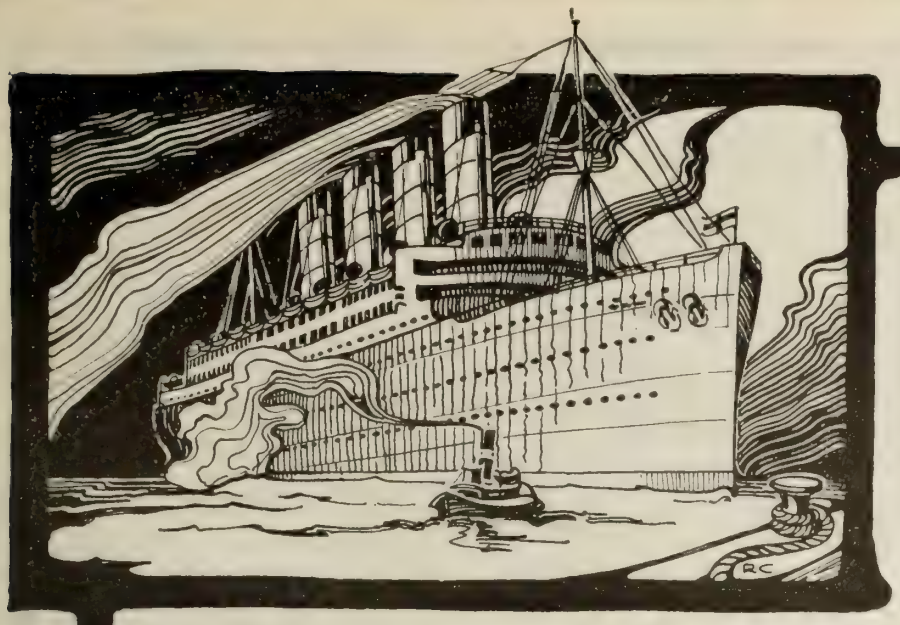
The reasons for economy are high efficiency of boiler and engine, low grade and cost of fuel, and the use of highly superheated steam, with no cylinder oil required.

Canadian Manufacturers and Sales Office:

Montreal General Tool Co., Limited

675 Notre Dame, Maisonneuve

MONTREAL, QUE. Phone La Salle 801



MARINE CASTINGS

NAVAL BRASS, BRONZE GUNMETAL and other ALLOYS

We are equipped to make castings weighing up to 3,000 lbs. each.

Our foundry is thoroughly modern and well equipped—We have recently doubled our melting capacity.

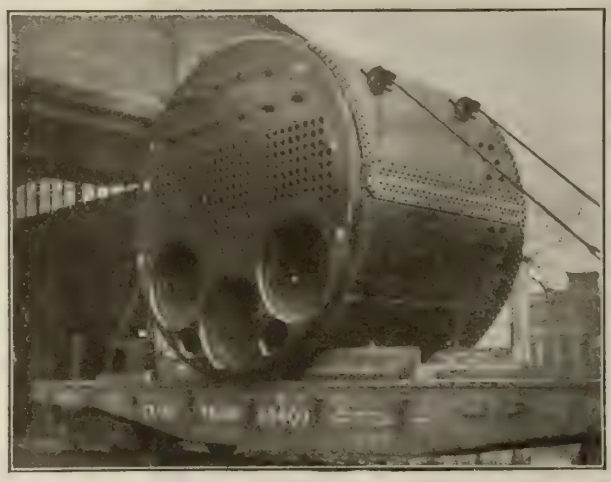
Send us your blue prints to figure on.

THE ROBERT MITCHELL CO., LIMITED

ESTABLISHED 1851

MONTREAL

We are in a position to build Scotch MARINE BOILERS in any size within limits required for Rail shipments.



This cut shows one of the 13' 6" diam. x 10' 6" Boilers built by us for the Department of Naval Service.

Send us your inquiries

MARINE BOILERS

ENGINEERING AND MACHINE WORKS
OF CANADA, Limited

Formerly St. Catharines Works
The Jenckes Machine Co., Ltd.

St. Catharines, Ont.

Eastern Sales Office:
HALL MACHINERY CO.
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Made in Canada

BITUNAMEL
REGISTERED

Unsurpassed for ship bottoms, piers and all ship work exposed or submerged and for waterproofing foundations.

The Ault & Wiborg Co.
of Canada, Ltd.
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Carried in stock at all branches

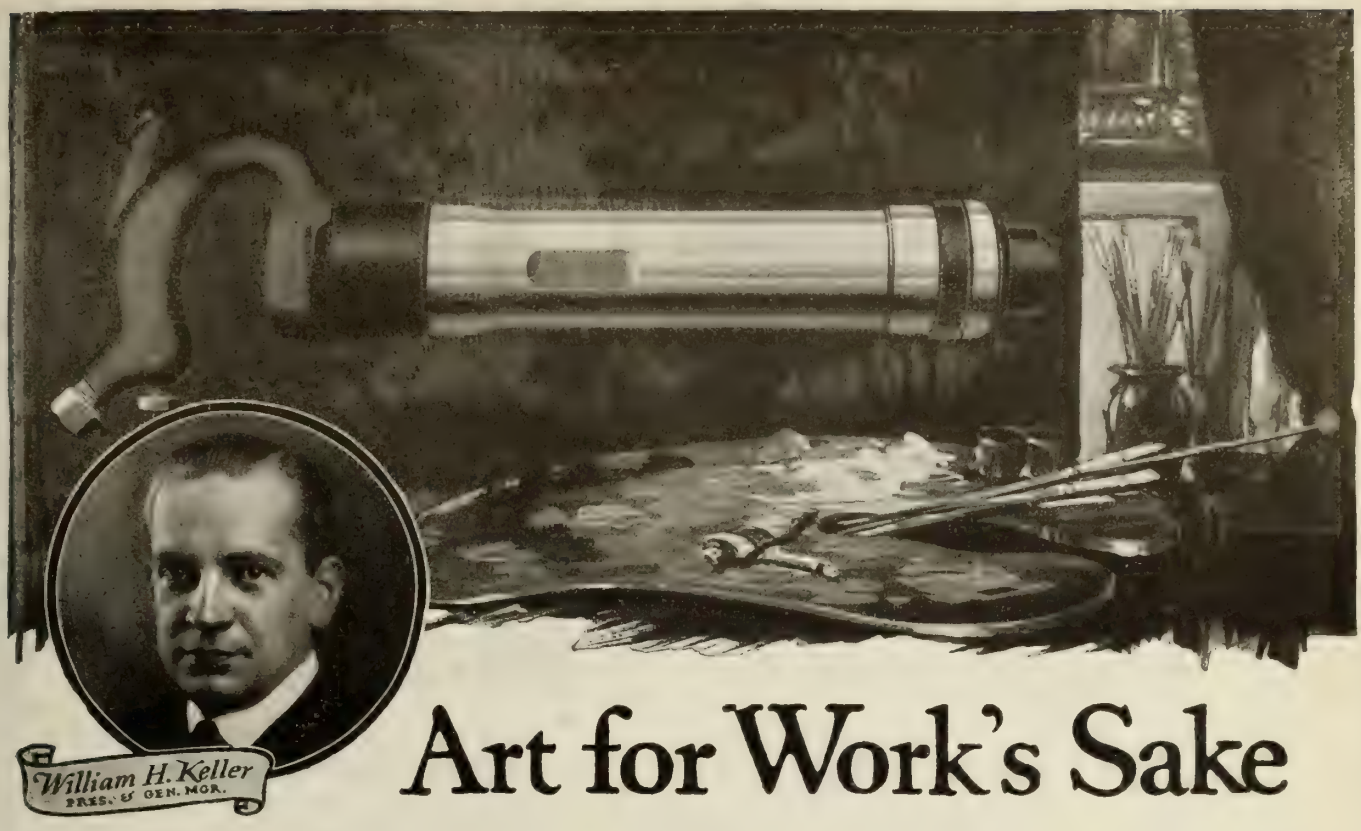
Ship Repairs
and
ALTERATIONS OF ALL KINDS

General Machinists and Manufacturers

HYDE ENGINEERING WORKS Limited

27 William Street, - - - - - MONTREAL

P.O. Box 1185. Telephones : Main 1863 and 1864



Art for Work's Sake

The longer I work at my job of designing and manufacturing Pneumatic Tools, the more profound becomes my appreciation of the truth of Emerson's dictum that "all beauty is organic."

With Emerson, I believe that the truest and most enduring forms of beauty, whether in people or buildings or flowers or machinery or tools, are structural in character, and never merely decorative. True beauty cannot be put on. It must be built in.

So when I am asked, as often I am, why we of the Keller organization spend so much of our time and effort on the external lines and finish of Keller-Made Master-Built Pneumatic Tools — why we bother about making them look pretty, as some visitors express it — I answer, we do nothing of the sort.

Our foremost and constant purpose is and always has been to produce tools that can be depended upon to give maximum service at minimum cost. It is by adhering unwaveringly to that purpose, and not through any desire to please the eye of the beholder, that we have succeeded in making our tools unusually symmetrical and attractive.

The beauty of Keller-Made Master-Built Pneumatic Tools is true beauty because it is truly *organic*—it is *inbuilt* at every stage of manufacture, from the machining of the cylinders up to the final sandblasting and lacquering of the handles.

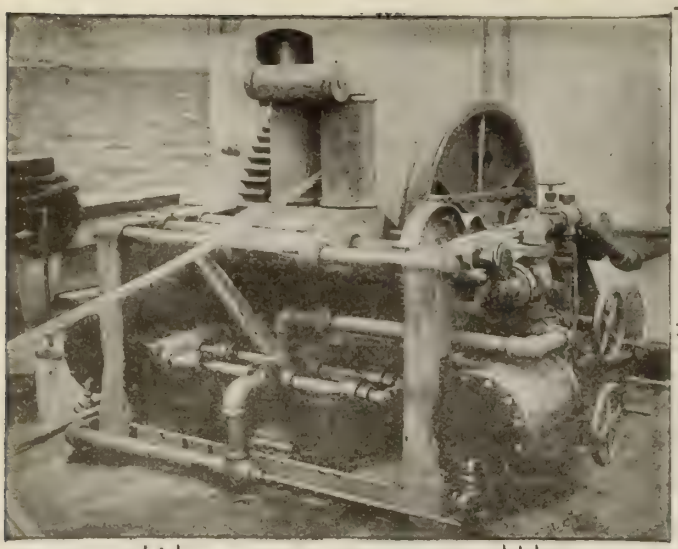
Keller-Made Master-Built Pneumatic Tools *look* best because they *perform* best. Their appearance, like their popularity, is the just measure of their worth.

KELLER-MADE
PNEUMATIC TOOLS
MASTER-BUILT

William H. Keller *President*

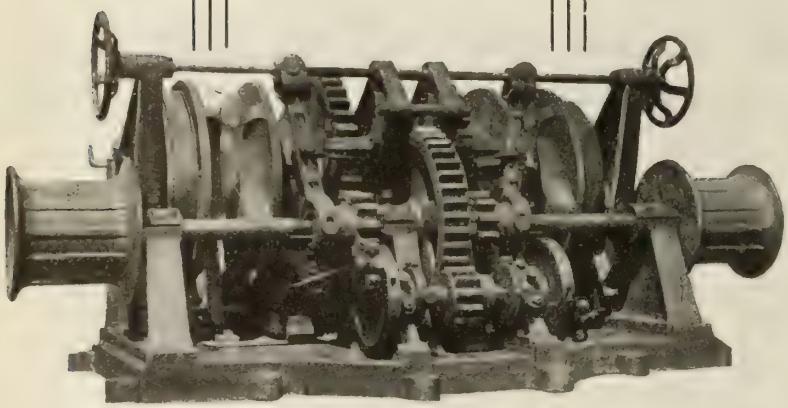
KELLER PNEUMATIC TOOL COMPANY, GRAND HAVEN, MICH., U. S. A.

If any advertisement interests you, tear it out now and place with letters to be answered.

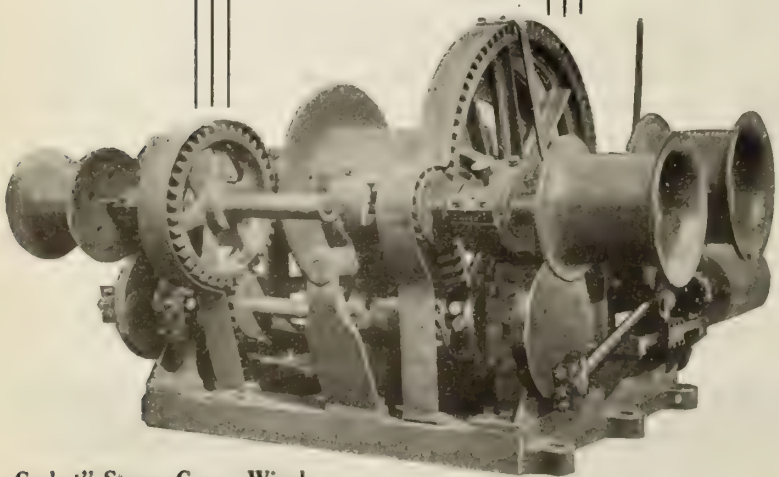


The "Corbet" Automatic Steam Towing Machine

For Tugs and Barges



The "Corbet" Double Cylinder and Double Purchase Steam and Hand Power Anchor Windlass



„Corbet" Steam Cargo Winch

Corbet

Line of Marine Machinery

THE CORBET AUTOMATIC STEAM TOWING MACHINES are made in five sizes to accommodate Steel Flexible Hawsers from 5/8 in diameter up to 2" in diameter.

The Most Modern Towing Machine on the Market Saves its Cost in Three Seasons

These machines are in active operation on tugs and steamers on the Atlantic and Pacific coast, and also on the Great Lakes. They are giving perfect satisfaction, as the numbers of testimonials from our customers will prove. Write for copies of testimonials and for full information.

THE CORBET DOUBLE CYLINDER AND DOUBLE PURCHASE STEAM AND HAND-POWER ANCHOR WINDLASSES are made in several sizes to accommodate Steel Chain Cable up to 1 13/16 in. diameter. Reversible throttle. Modern in every respect.

Our Cargo Winch is modern in every respect, being built to pass Government Inspection, and is giving perfect satisfaction.

Delivery When Promised—Satisfaction Guaranteed.

Write for prices and delivery in size required.

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Chas. P. Archibald & Co., 164 St. James Street, Montreal, Canada.
The A. R. Williams Machinery Co., St. John, N.B., Canada.
W. F. Davis Machine Tool Co., 85 Liberty St., New York, N.Y., U.S.A.



SHIP CASTINGS

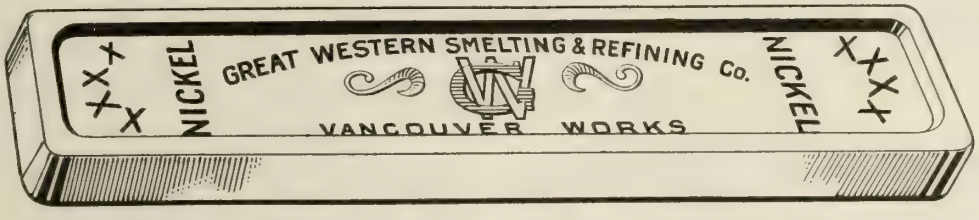
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STERN and RUDDER FRAMES, FAIRLEADS, ANCHORS, ETC.

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Transportation Building. Montreal

We Invite Your Inquiries



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PRODUCTS GIVE RESULTS

XXXX NICKEL BABBITT

Universally known—especially adapted for high speed and heavy pressure bearings.

None better for marine engine bearings
Serves where others fail

Great Western Smelting & Refining Co.

Manufacturers of All Grades of Babbitts, including Special No. 1 Railroad Babbitt for general service.

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The Publisher's Page

TORONTO FEBRUARY, 1919

MERITED PRAISE

A Great Record Well Recorded

IT is with pleasure we put in your hands this British Columbia Number of MARINE ENGINEERING OF CANADA. It will convey to our readers a real conception of the extent and importance of shipbuilding in the farthest west Province of our Dominion.

Indeed, we feel that a word of sincere praise is due British Columbia shipbuilders. And we know no better way of speaking our praise than to refer you to the pages devoted to British Columbia shipbuilding yards. There told is a story of enterprise that all Canada may be proud of.

In publishing the Great Lakes' Number of MARINE ENGINEERING OF CANADA last month, we endeavored to give an honest idea of shipbuilding in Ontario west of Kingston. So, too, in this British Columbia Number we have aimed at recording facts as we found them.

The same principle holds good in the preparation of material for the Eastern Canada Number for March. All leading shipbuilding yards from Kingston east will be subjects for descriptive articles in this Number. The editor is personally visiting yards at Kingston, Montreal, Three Rivers, Quebec, Levis, St. John, Halifax and other Eastern points.

Taken together, the Great Lakes Number, the British Columbia Number, and the Eastern Canada Number will present complete stories of shipbuilding in Canada.

Forgings

ALL CLASSES OF HEAVY OR LIGHT FORGINGS

Vancouver Forge Co., Limited
VANCOUVER, B.C.

WE
HAVE THE EQUIPMENT
WE
HAVE THE MATERIAL
YOU
WILL GET "SERVICE"

Vancouver Engineering Works., Ltd.

VANCOUVER, B.C.

STEEL AND IRON FOUNDERS,
ENGINEERS, BOILER MAKERS, Etc.

BOLT AND RIVET MANUFACTURERS

We specialize in Iron and Steel work of all descriptions for Steel and Wooden Shipbuilders.

Our Steel Castings

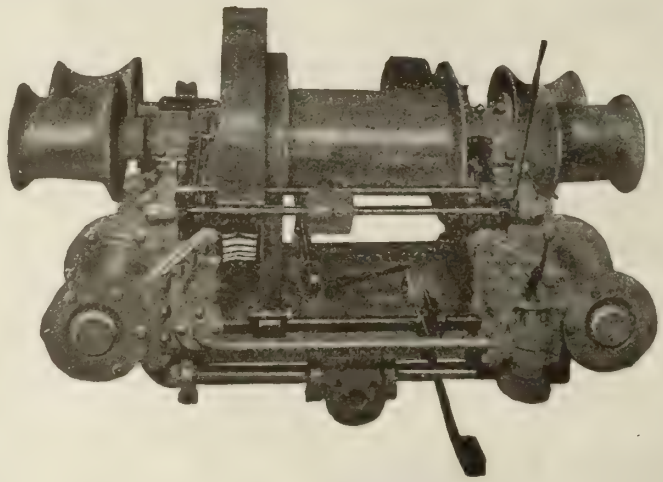
are thoroughly annealed and are accepted by Lloyds Bureau Veritas, Etc.

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The
North Shore Iron Works Ltd.
NORTH VANCOUVER - - B. C.

Winches, Windlasses, Marine and Stationary Coilers, Tanks, Iron and Brass Castings



WE have the equipment, the experience and the expert workmen necessary for the manufacture of marine machinery. Send us your specifications. Let us consult with you upon your requirements.

Iron and brass castings up to 5 tons.

Our Boiler Shop is capable of handling plates up to ½" thick and 10' wide.

Write us To-day

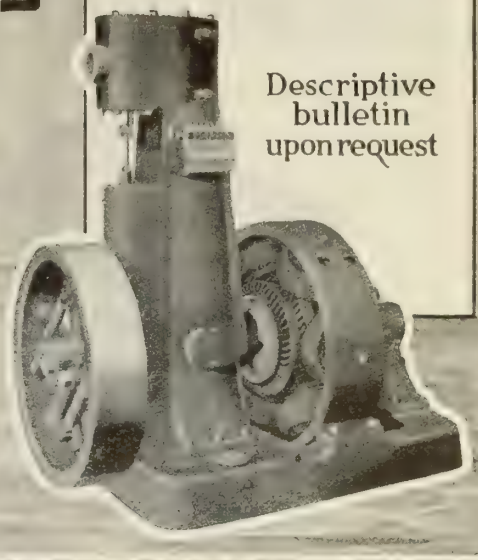
The North Shore Iron Works Limited
NORTH VANCOUVER, B.C.

Engberg

MARINE LIGHTING SETS

The Standard for Efficiency Durability Service





Descriptive bulletin upon request

ENGBERG'S
ELECTRIC & MECHANICAL WORKS
P. O. Box B. St. Joseph, Michigan, U S A

C. J. V. SPRATT, President — R. R. NEILD, General Manager — J. S. CLARKE, Marine Architect — C. W. O'NEILL, Secretary

Victoria Machinery Depot Co., Limited



STEEL SHIPBUILDERS — MACHINISTS, ETC. — BOILER-MAKERS

SHIP REPAIRS A SPECIALTY

LARGEST STEEL MARINE RAILWAY IN B.C. CAPACITY TO 3,000 TONS D.W.

SHIPS OVER 3,000 TONS DOCKED AT DOM. GOV'T DRY DOCK—ESQUIMALT

343 BAY STREET - - VICTORIA, B. C.

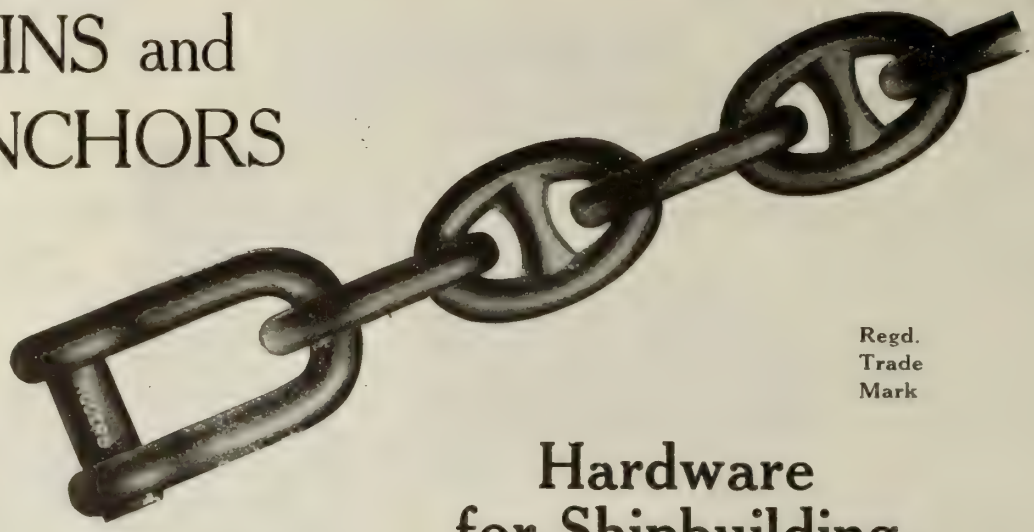
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WOLVERHAMPTON, ENGLAND

Established 110 Years

CHAINS and ANCHORS



Regd. Trade Mark

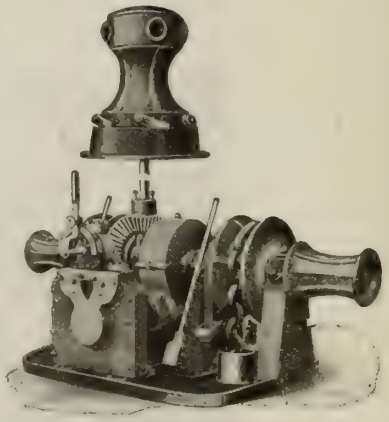
Hardware for Shipbuilding

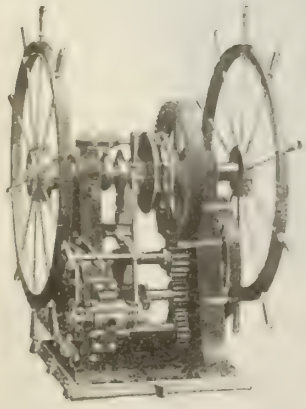
ADLRESS FOR CABLEGRAMS
ROGERS—WOLVERHAMPTON

The DAKE Line

Of Marine Machinery

Steam Steering Gears, Anchor Windlasses, Hand and Steam Capstans, Ship Winches and Ash Hoists





Require less space because there are no engines of equal horsepower that are as compact as the Dake.

Strong and sturdy of construction—built to endure hard, strenuous service—and their reliability and efficiency have been demonstrated by over twenty-five years of successful use.

Dake machines are simple and easy to operate, and require but little up-keep. The engine does not require constant skilled attention, but may be operated by a novice without endangering the safety of the crew or ship.

You can save money both on the initial and the eventual cost of your auxiliary machinery by installing Dake machines.

WRITE FOR CATALOG

Dake Engine Company, Grand Rapids, Mich.

Montreal Agents—Mussons Limited. Exchange Building. Chicago Agents—J. E. Chisholm, 654 Railway St. New York Agents—H. L. Droullard, 30 Church St.

MORE
Stratford Special No. 1
Marine Oakum

has been used by the U. S. Shipping Board Emergency Fleet Corporation contractors, the Navy Department and other branches of the Government than all other makes of Oakum combined, and not a single bale has been condemned or rejected.

This Oakum receives the highest classification of the American Bureau of Shipping and Lloyd's Register of Shipping.

MANUFACTURED ONLY BY

GEORGE STRATFORD OAKUM COMPANY

160 Cornelison Avenue :-: Jersey City, N.J.

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LOVERIDGE'S IMPROVED STEERING GEAR SPRING BUFFERS



Art. 656 (Pattern B) Art. 655 (Pattern A) Art. 657 (Pattern C) Art. 658 (Pattern D) Art. 659 (Pattern E) Art. 660 (Pattern F)

Also makers of Self-Oiling, Cargo, Heel, and Tackle Blocks

Particulars and Prices on Application

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The Broughton Copper Co., Ltd., Manchester.

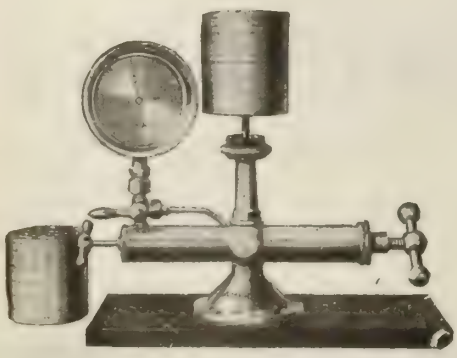
Copper Smelters and Manufacturers.-Fluid Compressed Hydraulic Forged

COPPER, BRASS AND BRONZE

TUBES

For Marine, Locomotive and other purposes.

Ingots, Rods, Sheets and Plates. - Electro-Coppering and Alloys.



START THE NEW YEAR RIGHT

Make sure of the ACCURACY OF YOUR GAUGES and then arrange to make PERIODICAL TESTS during the year to see that this accuracy is maintained.

THE AMERICAN DEAD WEIGHT GAUGE TESTER

simplifies gauge testing

Agents for Canada: CANADIAN FAIRBANKS-MORSE CO., Limited
Montreal Toronto Quebec Calgary

AMERICAN STEAM GAUGE & VALVE MFG. COMPANY
New York Chicago BOSTON Atlanta Pittsburgh

Where there's a WILT—

There's the Way



WILT

High Speed and Carbon

TWIST DRILLS

Use Made-in-Canada Drills for Made-in-Canada Ships



In some instances it is necessary to use "imported lines" in order to secure the best quality. Not so in the case of High Speed and Carbon Drills.

WILT HIGH SPEED AND CARBON TWIST DRILLS are made-in-Canada and are equal in quality to the best drills made anywhere. Put WILT to the test—compare their work with any other drill made and watch the result.

WILT TWIST DRILL CO. OF CANADA, LIMITED

WALKERVILLE - ONTARIO

London Office: Wilt Twist Drill Agency, Moorgate Hall, Finsbury Pavement, London, E. C. 2, England

DEIGHTON'S PATENT FLUE AND TUBE CO., LTD.

Cables: "FLUES," LEEDS.
Codes: A1. 4th Edition, ABC 5th Edition.

Makers of



Deighton, Morison & Fox Type

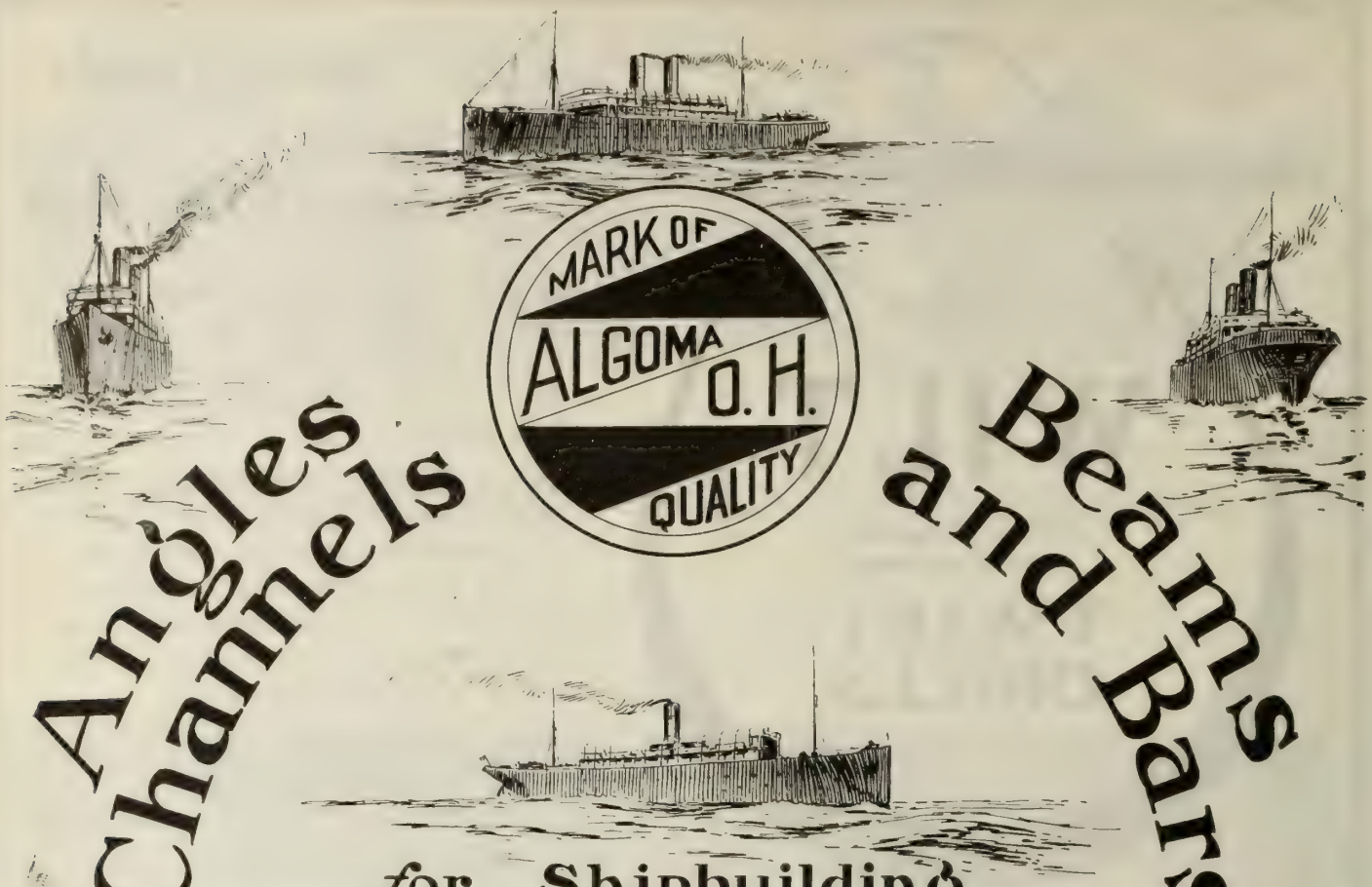
Corrugated Furnaces

For Marine and Land Boilers

No Type of Furnace has a Greater Heating Surface Per Foot Run Than the Deighton Section.

Particulars and Catalogue on Application.

VULCAN WORKS, LEEDS, ENGLAND





ALGOMA STEEL CORPORATION, LIMITED
SAULT STE. MARIE, ONTARIO

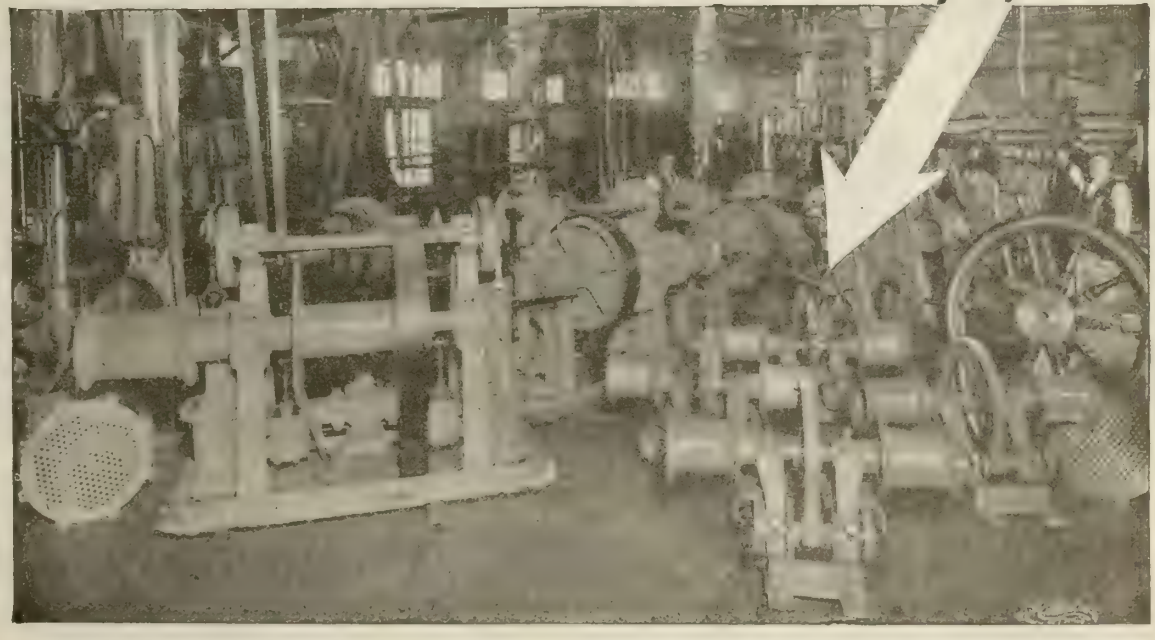
A Shipment of Winches and Windlasses

A SPECIALTY of deck machinery and special castings is made in our factory. General marine repairs and pattern-making.

The illustration shows one shipment of winches and windlasses just finished in our machine shop.

We are fully equipped to handle your requirements.

Terminal City Iron Works
Vancouver - B.C. - Canada



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LOOK! NOW IS THE TIME TO BUY YOUR MACHINE SHOP EQUIPMENT LOOK!

The Entire Plant of the British Munitions Company

FOR SALE

Lathes, Drills, Grinders, Furnaces, Punch and Shears, Milling Machines, Twist Drill Grinders, High Speed Hack Saws, Blowers, Compressors, Hydraulic Pumps, Motors, Arbor Presses, Bliss Presses, Oil Tanks, Electric Drills, and a very large number of Machine Tools.

Also supplies of all kinds, including Shafting, Hangers and Pulleys, Belting, Steel Lockers, Time Clocks, Trucks, Standard and Hydraulic Valves, Pipe Fittings and Packing Tool Steel, Twist Drills, Milling Cutters, Taps, Files, and complete machine shop equipment.

Everything offered at attractive prices. Write NOW for further information and quotations.

WILLIAMS & WILSON, LIMITED

320 St. James Street :: :: MONTREAL, QUE.

SCIENTIFIC NAVIGATIONAL EQUIPMENT



The Sperry Gyro-Compass Equipment for Merchant Vessels comprises master compass controlling repeaters located in pilot house, bridge and Captain's cabin.

THE SPERRY GYRO-COMPASS

Over 1100 now in use aboard naval ships.

The Gyro-Compass being non-magnetic removes the possibility of errors in laying courses due to the constantly changing factors of deviation and variation, and due to its greater directive force and positive action makes for closer steering and greater economy of operation.

Patentees and manufacturers also of the following: Gyro-Ship Stabilizers, Sounding Machines, Helm Angle Anticipators, Searchlights, Ships Logs, Electric Engine Room Telegraph, etc.

THE SPERRY GYROSCOPE COMPANY

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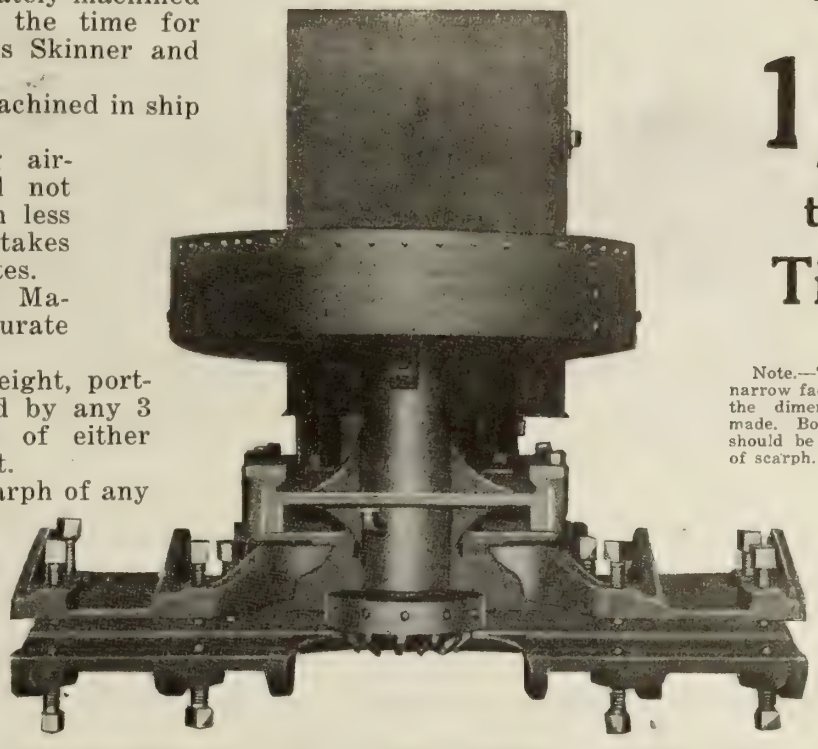
British Office and Works
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London, S. W. 1

Great Lakes District Office
828 Guardian Building
Cleveland, O.

Cuts Perfect Scarphs

Think of cutting a perfect scarph in 10 minutes!
Or a complete, clean, accurately machined scarph in 20 minutes, if the time for changing and resetting this Skinner and Eddy Machine is included.
Three scarphs accurately machined in ship plate EVERY hour!
A skilled workman using air-driven chipping tools will not chip one average scarph in less than 60 minutes. Usually it takes about an hour and 15 minutes.
And this Skinner & Eddy Machine cuts a smooth, accurate scarph **every time.**
This Machine is light in weight, portable, and speedily operated by any 3 H.P., 1,200 R.P.M. motor of either direct or alternating current.
It will cut at any angle a scarph of any length up to 16 inches and of any width up to 8 inches, and it is readily adjustable to plate of any thickness.
Already over 30 leading shipbuilders in the United States have adopted this Scarphing Machine—

In 1/3 the Time



Front View Showing Cutter Head and Clamping Arrangement. All Gearing Guarded.

Note.—The diameter of the narrow face of the cutter will be the dimension of the scarph made. Both right and left hand should be ordered for each size of scarph.

and every user of it has proved it a profit-maker. These Scarphing Machines are also used in France, England and Japan. Your request will bring full particulars and in no way obligate you.

Write Us for Machines that Make Shipbuilding Profitable

Take the McBride Hydraulic Ship Plate Tightener as another example of our ability to furnish "machines that make shipbuilding profitable." This machine is capable of exerting a pressure of 20 tons upon a steel plate, so that it can be bolted into place. Still it weighs but 50 pounds and is easily handled and operated by one man. We also make a Machine exerting 60 ton pressure, approximately. Ask for all particulars of the New Improved Model.

McBride Patent Hydraulic Ship Plate Tighteners

Liner Roll Machines

Portable Countersinking Machines (Motor Driven)

Propeller Hub Tapping Machines

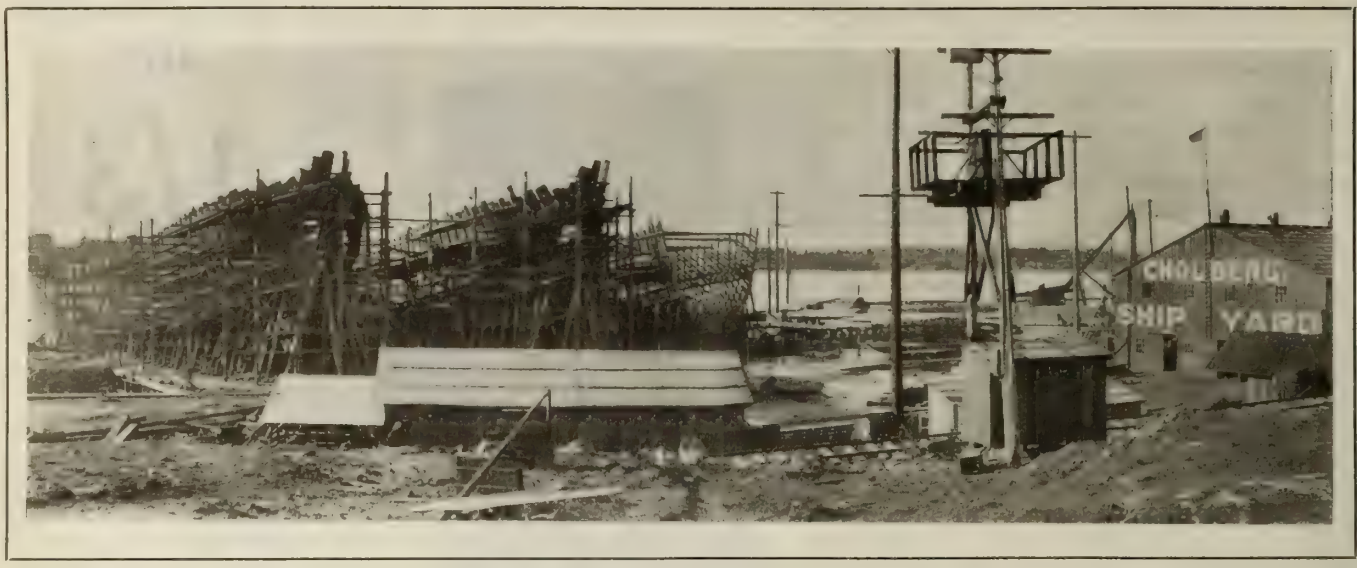
Bolting up Machines

Angle Bevelling Machines

SHIPBUILDERS MACHINERY COMPANY, INC.
MAYNARD BUILDING
SEATTLE WASH.

CHOLBERG SHIP YARD

Victoria Harbour . . . . . Victoria, B. C.



Vessels designed and built under Personal Supervision of a Practical Shipbuilder

HAVE PLANS FOR SEVERAL TYPES APPROVED BY **NORWEGIAN VERITAS**

Mackinnon Steel Co., Limited
Sherbrooke, Que., Canada

Fabricators and Erectors
Specialists in

Structural Steel and Steel Plate Work

of every description

for Wooden and Steel Ships.
A large stock of shapes and plates always on hand.

Your enquiries are desired.

HIGH GRADE
ELECTRIC STEEL CASTINGS

OPSAL STEEL CO.
(Formerly Columbia Block and Tool Co.)
DUFFERIN AND QUEBEC STREETS
VANCOUVER, B.C.

PORT OF VICTORIA



A View of the Inner Harbour



Provincial Government Buildings

SHIPPING, year ending 31st March, 1918.	Vessels	Tonnage
Coasting trade, entered and cleared	7,454	4,223,399
Ocean trade, entered and cleared	3,049	3,903,285
TOTALS	10,503	8,126,684

ADVANTAGES OF THE PORT

Ease of entry, deep water, and no obstacles to navigation.

Absence of fog sufficient to impede entry or departure of vessels.

Pilotage and port charges lower than at any other port on Pacific Coast.

CANADIAN GOVERNMENT DOCKS

Five million expended to date, new freight shed 200 x 700 feet.

Most modern equipment, electric cranes and railway connection.

SHIPBUILDING

All shipbuilding yards, both steel and wooden, working to capacity and sufficient orders on hand to guarantee operations for several years to come.

For Further Particulars Write

INDUSTRIAL COMMISSIONER

VICTORIA, B.C.

FORD-SMITH

Milling Machines

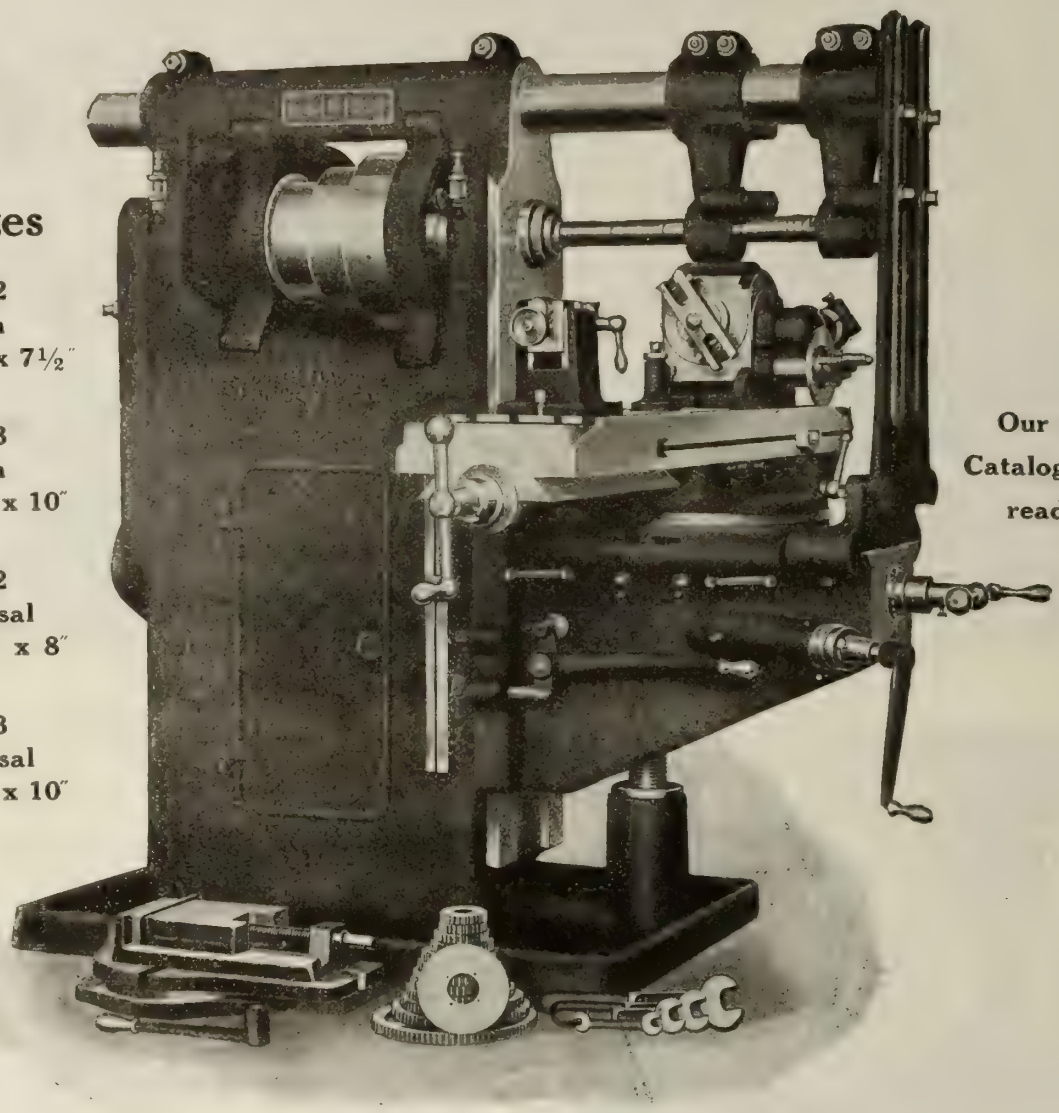
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These machines are accurate, strong and rigid, with well-balanced design to handle rapid and accurate production.

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IRON AND BRASS FOUNDERS

Modern facilities for quick despatch of repairs to both steel and wooden vessels. Makers of manganese bronze propellers and large marine castings.

Marine Railway, Length 315 ft., Capacity 3000 Tons D. W.
Esquimalt Dry Dock 480 ft. x 65 ft.

Port Arthur Shipbuilding Company, Ltd.

PORT ARTHUR, ONTARIO, CANADA

Designers and Builders

Steel Ships, Engines, Boilers, Etc.

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Leaving plant of Port Arthur Shipbuilding Company, Ltd., on completion, May, 1914.



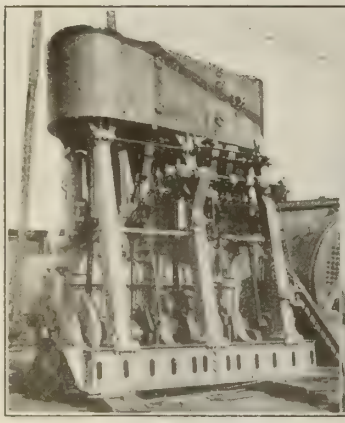
Passenger and Freight Steamer

Length Overall 385 ft.

Breadth Moulded 52 ft.

Depth Moulded 28 ft. 9 in.

Gross Tons 6,905



1500 H.P. Engine, Triple Expansion



Fourteen of these Trawlers for Dept. of Naval Service



Wheel Casting 14 ft. 9 in diameter

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Built at Port Arthur Ship building Company, Ltd. Year 1914.



Bulk Freighter

Length Overall 625 ft.

Breadth Moulded 59 ft.

Depth Moulded 32 ft.

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The above are some of the products of our plant

We are also fully equipped with every modern facility for REPAIR WORK

DRY DOCK 700' x 93' x 16'
Four Building Berths

General Offices and Plant:
PORT ARTHUR, ONTARIO

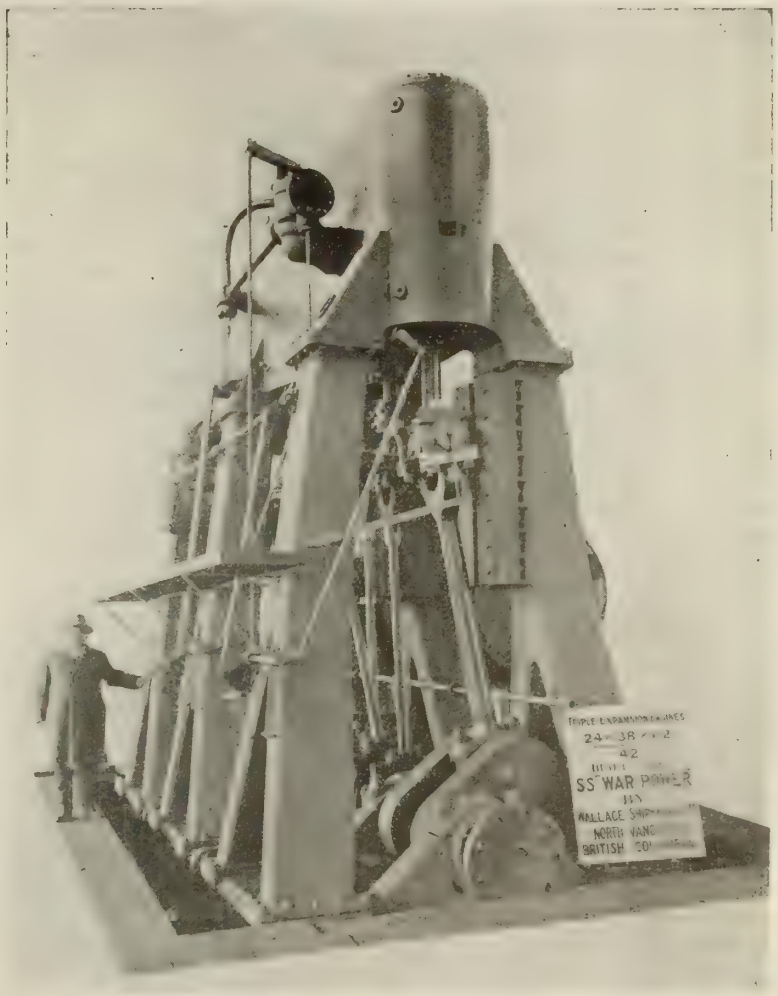
MARINE ENGINEERING of Canada

Volume IX. TORONTO, FEBRUARY, 1919 Number 2

British Columbia's Part in Ship Programme

The Year Has Seen a Tremendous Revival of Industry in the Pacific Coast Province—What the Future Has in Store.

By A. F. MENZIES



DURING the past twelve months or so, British Columbia has, so to speak, come into her own as regards shipbuilding. The extensive program undertaken by the Imperial Munitions Board Wooden Shipbuilding Department has been completed, resulting in the addition of 27 wooden steamers of a total D. W. capacity of over 75,000 tons. Of steel boats 40,000 tons D.W. have been passed into service.

The Imperial Munitions Board wooden shipbuilding programme was carried out by yards which built the hulls only, the Imperial Munitions Board being responsible for the supplying and the installation of machinery, etc. The 27 hulls were divided up between the following concerns: Wm. Lyall Shipbuilding Co., Ltd., 6; Western Canada Shipyards Ltd., 6; Western-Genoa Co., Ltd., 4; The Foundation Co. of Victoria, Ltd., 5; New Westminster Construction and Engineering Co., Ltd, 4; Coquitlam Shipbuilding Co., Ltd., 2.

The boats are of the well decked type with the poop extended to the bridge deck. They are 250 feet long B.P., by 42 ft. x 6-in. mld. beam, by 25 ft. mld. depth. The carrying capacity on a draught of 21 ft .is about 2,800 tons.

The hull is divided into several compartments by watertight bulkheads, which will materially assist in keeping the vessel afloat should it become damaged. About one and a half million feet of lumber was used in each boat, while for caulking over 350 bales of oakum were required.

The following brief description of the more important timbers will give an idea of the sizes of lumber used. Fig. 1 shows one of these boats being framed.

The keel is in four pieces all 20 x 24 in and from 54 to 76 ft. in length, the various lengths being joined together by scarps, the dimensions of which are also 20 x 24 in. and the sister keelson 24-ins. square. These sticks are in as long lengths as is practicable and the scarps are carefully shifted in order to maintain the maximum possible strength throughout.

On the top of the wooden keelson there is a steel box girder keelson consisting of top and bottom plates 25 and 40 ins. respectively by ¾-in., web plates



FIG. 2—LAUNCH OF "WAR STORM"

24-in. x ½-in., all secured by 6-in. x ½-in. angles.

The frames are doubled 12-in. sided and are tapered from 24-in. at the keel to 11-in. at the main deck. They are spaced 3 ft. centres. There are three garboard strakes, the first being 18-in. x 10-in. The planking is all 6-in.

The ceiling on the bottom is 12 x 10 in., on the turn of the bilge 14 x 14 in., and 12-in. x 10-in. and 8-in. on the sides. In order to avoid local weak spots the butts of the planking and ceiling are well shifted.

On the line of the hold beams there are two stringers each 14-in. x 16-in. and one clamp 14-in. square. The main deck stringer is composed of three strakes of 14in. x 14-in. These sticks are also in long lengths.

The main deck beams are 14-in. by 14-in., spaced 3 ft. centres, that is, one on every frame. The main deck is of 4½-in. x 4½-in. edge grain. Edge grain timber is used for decking on account of its wearing qualities, also there is no tendency to sliver. The narrow planking is preferable on account of the lessened amount of contraction and expansion to be taken care of at each seam. The upper deck is 3½-in. x 3½-in., also edge grain.

The propeller post is 30-in. moulded by 24-in. sided, being swelled to 32-in. at the shaft line. The shaft log, another large piece, is composed of two pieces of 36-in. x 18-in. To bracket the various parts together a large number of natural knees are used.

There are three cargo holds and one deep tank for water ballast, the holds and tanks being separated by watertight bulkheads. The cargo holds are served by six steam winches operating through 5-ton derricks.

Some of the propelling machinery was procured in the East, the remainder being built by the Wallace Shipyards Ltd., of North Vancouver.

The engines are triple expansion, having cylinders 20-in. x 33-in. and 54-in. in diameter, with a common stroke of 40-in. and operate at about 70 R. P. M., developing 1,000 I.H.P.

The boilers are of the Howden water tube type, fitted with Howden's system of heated forced draught. About half the total number of boilers required were built by the Victoria Machinery Depot, of Victoria, B.C.

All the deck auxiliaries are products of British Columbia, the winches and windlasses being built by the Terminal City Iron Works, The North Shore Iron Works and Hutchison Bros. The steering gears, horizontal, double-geared machines, were built by the Schaake Co., Ltd., and Yarrows Ltd.

As previously mentioned, the shipbuilders were not responsible for the installation of machinery. This work was carried out by the Imperial Munitions Board at their own plant at Ogden Point, Victoria. The delivery of hulls, was, however more than fast enough to load this plant up, and to avoid delay several ships had their machinery installed at private yards.

On trials, with bunkers aboard, these vessels have made a speed of 11 knots per hour.

Three steel boats have been placed in commission by the Wallace Shipyards. These boats were built to the order of the Imperial Munitions Board and are 300 ft. long B.P. by 45 ft. mld. beam by 27 ft. mld. depth and carry 4,700 tons on a draught of 22 ft., 7 in. Fig. 2 shows the War Storm being launched in September.

With the exception of auxiliary apparatus in the engine room these boats are entirely British Columbia products. The main engines were built in the yards machine shop. The boilers were built by the Vulcan Iron Works at their plant on Granville Island. Deck winches and windlasses were built by the North Shore Iron Works, of N. Vancouver.

The vessels are of the well decked type with the machinery located amidships. Officers' quarters are on the bridge deck and crews' quarters in the poop. Extra large hatches are provided for convenience in handling cargo.

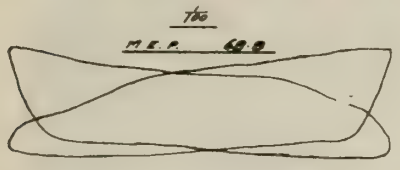
The engines are triple expansion with cylinders 24-in., 38-in. and 62-in. in diameter with a common stroke of 42-in. They are fitted with piston valves on the H.P. and I.P. cylinders and a double-ported, balanced slide valve on the L.P. The title cut shows a set of these engines in shop ready to be dismantled and installed in the boat. It will be seen that bridge columns are provided both back and front, giving a remarkably rigid job.

There are no pumps on the main engines, the idea being that the jobs could be turned out and installed quicker if these items were made independent. The circulating pump was of the centrifugal type, supplied by the Morris Machine Works. The condenser, made by the Wallace Shipyards, was built with a steel plate shell, rolled brass tube

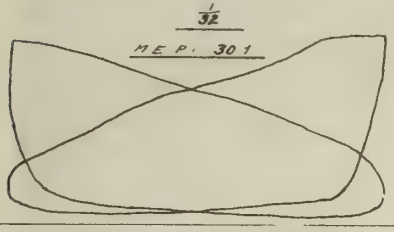


FIG. 4—VULCAN IRON WORKS BOILER SHOP

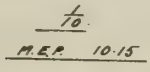
plates and cast iron ends. It was supported on the back of the I.P. and L.P. columns by steel plate stools. The air and feed pumps were made by Dean Bros., of Indianapolis, and were supplied

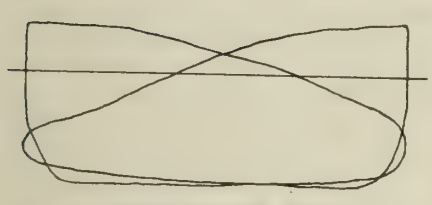


HIGH PRESSURE CARD



INTERMEDIATE CARD





LOW PRESSURE CARD

SHIP

Draught For'd, 8' 2"
Draught Apt, 14' 6"
Draught, Mean, 11' 4"
Displacement, 3,090 tons.
Length B.P., 300 feet.
Beam Mld, 46 feet.
Depth Mld, 27 feet.

ENGINES 24" x 38" x 62" / 42"

Pressures

Boiler, 160 lbs. per sq. inch.
I.P. Receiver, 58 lbs. per sq. inch.
L.P. Receiver, 4.5 lbs. per sq. inch.
Condenser, 25.5 inches vac.

Powers

H.P.	....	553 I.P.H.
I.P.	....	606 I.H.P.
L.P.	....	546 I.P.H.
Total	.. ..	1,705

Propeller 15' 0" dia., 15' 6" pitch.
Revolutions per min., 84.
Speed, 12 knots per hour.

FIG. 5—TRIAL TRIP DATA

by F. Darling & Co., of Vancouver. These pumps are of the simplex type, the main feed pump having a long stroke and being large enough to handle the work at very slow speed. The other auxiliary pumps were of the duplex type and were also supplied by F. Darling & Co.

Steam was supplied by two Scotch marine boilers 15 ft., 6-in. diameter by 11 ft., 3-in. long, working at 180 pounds per square inch. The total heating surface provided was 5,108, the grate area being 132 square feet, giving a ratio of 1 to 38.7.

The boilers were built by the Vulcan Iron Works. Fig. 4, showing one side of the main bay of their shop, shows the boilers for the War Storm among a number of others for J. Coughlan & Sons' ships.

On trial these boats have done up to 12 knots per hour, with bunkers aboard. Fig. 5 shows the trial trip data obtained on the War Power on June 27, 1918.

The machine shops of the Wallace Shipyards have been more than busy, for, besides engines for their own boats and repair jobs, they have turned out three sets of engines for the Imperial Munitions Board wooden ships. Two of these sets were also installed and the ships completed and delivered under steam at Victoria.

These engines differ from those in the steel boats in that the pumps are driven from the I.P. crosshead by single plate levers, and the condenser shell is of cast iron and is built-in.

The Wallace Foundry has furnished the castings for all this machinery as well as doing a lot of outside work, notably a contract, for 27 cast iron propellers for the Imperial Munitions Board.

An interesting job carried out by the yard was the lengthening of a couple of steel tug boats, the Point Grey and the Point Ellice. The former was built by the Wallace Shipyards and the latter by McDougall & Jenkins, now the North Shore Iron Works. They belong to the Department of Public Works and were employed as dredge tenders. On the dredging work being closed down they were taken over by the Imperial Munitions Board, Aeronautical Department, for towing spruce logs. As both the boats were built for harbor service their bunker capacity was not large enough for log towing, which would require the boats to be away from their base for about three weeks at a time They were both oil burners and it was decided to lengthen them and build in additional oil tanks.

The boats were both hauled out on the large ways at the same time, the ends separated and the new portion built in. The boilers were then shifted aft to the same relative position in relation to the engines which they occupied before, and a new oil-tight bulkhead built forward of them. The space thus provided between the old and the new bulkheads gave ample capacity for the fuel oil.

As the boats were short, 100 ft. and 91 ft., 6 in. respectively, and very fully powered, some interesting calculations were entailed to ensure that, when lengthened, they would trim properly.

The Wallace Shipyards plant has recently undergone extensive alteration and extension, a new plate shed and mold loft being constructed. Fig. 6 shows the latter, which is 186 feet long by 80 feet broad. It is located above the plate shed, which is equipped with a mono-rail system for handling plates, etc. Three building berths have been provided, capable of taking vessels up to 400 feet long.

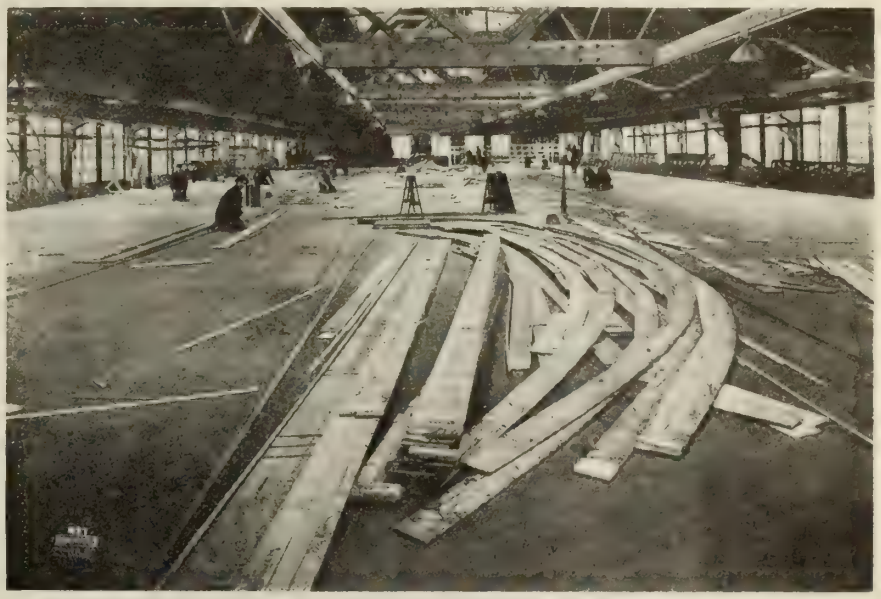


FIG. 6—MOLD LOFT AT WALLACE SHIPYARD

The system of handling material from the plate shed to the building berths is by standard gauge railroad running between the berths. At each end of the berths a tower is located under which the tracks run. The towers are 48 feet high and each tower carried a pair of derricks equipped with 80-ft. booms. As the towers are high enough to permit the boom to swing across the deck of a ship, it appears to be an excellent system.

The work of extension has been carried out by Messrs. Hodgson and King, contractors, of Vancouver.

The Wallace Shipyards have at present under construction two steel boats

of 4,300 tons D.W. and two of 5,100 tons D.W. for the Dominion Government.

The former are 320 ft. long B.P., by 44 ft. mld. beam, by 25 ft. mld. depth, and are designed to carry their deadweight on a mean draught of 21 ft., 2 in. A 6 hour loaded trial is called for and a speed of 11½ knots is to be maintained.

Accommodation is provided for 34 officers and men, the former being berthed in deck-houses on the bridge deck amidships and the latter aft.

11 steam winches and an anchor windlass are provided for handling cargo and anchors. These auxiliaries are being built by the North Shore Iron Works.

The propelling machinery consists of a set of triple expansion engines having cylinders 25 in., 41 in. and 67 in. with a common stroke of 45 in., the air, feed and bilge pumps being driven from the L.P. crosshead.

Steam is supplied by two single ended Scotch marine boilers 15 ft., 6 in. diameter by 11 ft., 6 in. long, working at 180 pounds per square-inch. The boilers are operated under heated forced draught, the well known Howden's system of closed ashpits being used.

The 5,100-ton steamers which this firm is building for the Dominion are of the type "C" of the standard series They are 331 ft. B.P. by 46 ft., 6-in. mld. beam by 25 ft., 6-in. mld. depth, and have a mean draught of 21 ft., 8 in.

A speed of 12 knots loaded is specified, the main engines being 25 in., 41 in., and 68 in. by 45 in., with air, feed and bilge pumps attached, the circulating pumps being of the centrifugal type driven by a small indenendent engine. There are three boilers 14 ft. diameter by 11 ft., 6 in. long, working at 180 pounds per square-inch. The boilers are operated under forced draught, approximately 7,275 square-feet of heating surface being provided. The arrangement of the boilers in the ship shows the three abreast, consequently there are no side bunkers in either the engine room or stokehold. Permanent bunkers are provided under the bridge deck and a large cross bunker forward of the stokehold. On short passages the latter could be used for cargo.



FIG. 7—HULL OF THE MARGARET HANEY, AUXILIARY POWER SCHOONER, UNDER CONSTRUCTION

The boilers for these boats as well as those already turned out will be built by the Vulcan Iron Works at their plant on Granville Island, Vancouver. The Vulcan Iron Works, have, since the destruction by fire of the boiler shop at the shipyard of J. J. Coughlan & Sons, supplied that firm with boilers for their vessels. This boiler shop is fully modern in every respect, having been built within the last few years and recently extended.

The equipment consists of a three ram flanging machine, a 12 ft. plate bender, and a large riveter, all operated by hydraulic power. Drilling holes, the usual bugbear of the boiler shop is very well taken care of, a two-head, movable column drilling machine being provided for shell drilling and several radial drills being available for combustion chamber work. One of the recent additions to the plant is the machine shop in which all tools are made, stays threaded and work of a like nature carried out.

The plate furnace, for annealing the large end plates after flanging is rather



VIEW OF J. COUGHLAN & SONS' SHIPBUILDING PLANT VANCOUVER, B.C., SHOWING FROM LEFT TO RIGHT:—SS. WAR CAMP, SS. WAR CHARGER, SS. WAR CHIEF



FIG. 8—DECK VIEW OF AUXILIARY SCHOONER

interesting in that the fuel used is slabs, which are obtained as refuse from the local sawmills. The rivet heating furnace at the hydraulic riveter uses the same fuel. Both have given every satisfaction. They were installed by Mr. T. A. Thomas, of Nanaimo, B. C.

Besides the large marine boilers, the Vulcan Iron Works have handled a lot of other work, among which was the finishing of the rudders for the Imperial Munitions Board wooden ships, the hydraulic riveter being used for riveting the plate to the arms. A number of smoke stacks and uptakes were also built for these boats. Two large locomotive boilers were built for the Canadian Collieries (Dunsmuir), Ltd., who operate an extensive coal field on Vancouver Island. These boilers were installed in existing locomotives, the boilers of which were worn out. A number of large digesters were also built for a local pulp mill.

Fig. 4 shows one side of the main bay of this plant and the string of boilers 14 ft., 9 in., and 15 ft., 6 in. in diameter proves that the manufacture of this type of kettle is well established in British Columbia.

The Wm. Lyall Shipbuilding Co., Ltd., of N. Vancouver have, since the completion of their contract with the Imperial Munitions Board, been working for their own account on a programme of six auxiliary powered schooners.

These boats are five-masted topsail schooners, and, with the exception of the addition of topsails and some slight alteration to the sheer line and deck houses are the same as the first boats built in this yard when it was established as the Wallace Shipyards Plant No. 2.

The schooners are 225 ft. long on the keel by 44 ft., 6 in. extreme beam by 20 ft., 9 in. mld. depth. They will carry about 2,500 tons D.W.

Three of these boats are fitted with twin Atlas Diesel engines of about 175 B.H.P. each, the remaining three with Fairbanks-Morse semi-Diesel engines of 200 B., H. P. each.

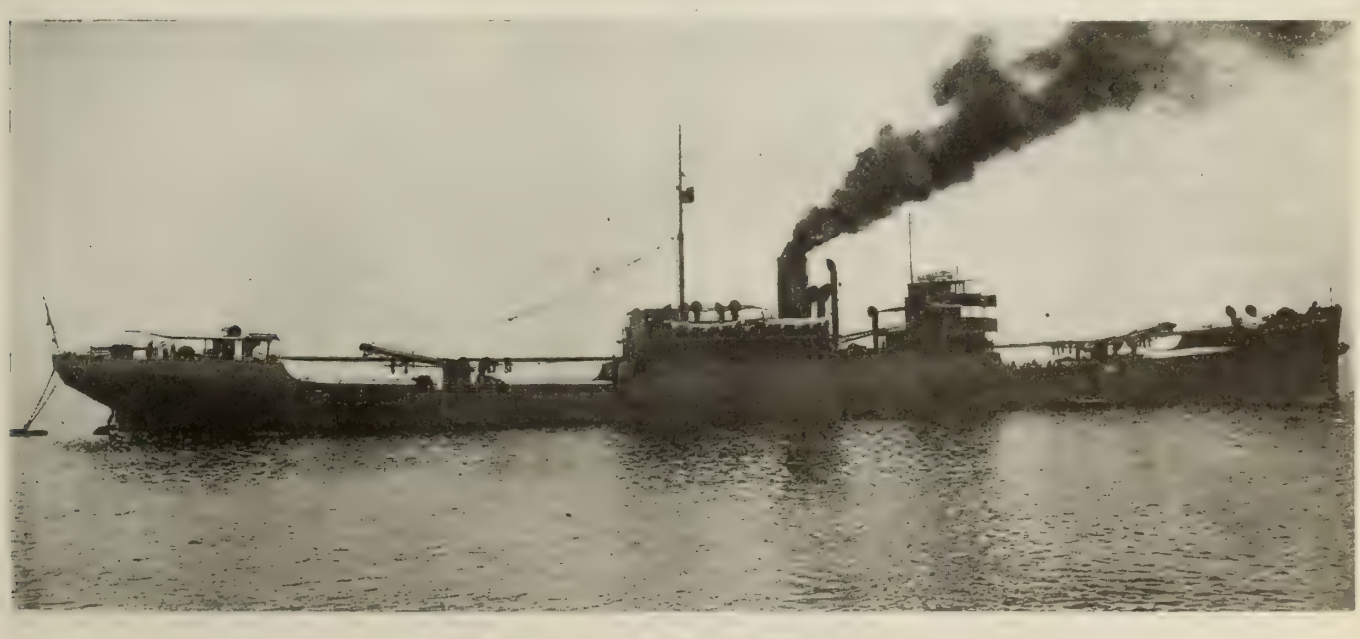
At the time of writing three of the schooners have been launched and were in various stages of completion. The others will probably all be launched by the end of the year.

This yard is equipped with six building berths and as they are vacated by the schooners, keels are being laid for a contract for eight steamers for French interests.

The dimensions of these boats will be 195 ft. B.P., 204 ft., 6 in. over all by 39 ft., 8 in. mld. beam by 17 ft. depth of hold and on a mean draught of 16 ft. will carry about 1,500 tons D.W.

Two masts are provided and are fitted with two derricks each for cargo handling. The deck auxiliaries comprise six cargo winches by M. Beatty & Sons, an anchor windlass by the Terminal City Iron Works, of Vancouver, and a steam steering gear by the Schaake Co., Ltd. The steering gears are of the same type which this firm supplied to the Imperial Munitions Board for their wooden ships.

The propelling machinery consists of two sets of compound engines having cylinders 12 in. and 24 in. with a common stroke of 16 in. The engines are being supplied by the Sorel Mechanical Shops, Sorel, Quebec. They are arranged back to back in the ships with the operating gear led to the space between them. At their rated speed an



SS. WAR CAMP READY FOR MAIDEN VOYAGE



WOODEN SCHOONER ALICE BEAUCLERC ON THE WAYS

output of 550 I.H.P. will be obtained. There are no pumps attached to the engines, all auxiliaries being independent.

Steam is supplied by a Scott water tube boiler having 2,012 square-feet of heating surface, 56 square-feet of grate area, giving a ratio of about 1 to 36. Steam for cargo handling is supplied by a smaller boiler of the same type operating at 125 pounds working pressure.

Twelve more ships of a similar description, and for the same owners are being built in British Columbia. They are apportioned as follows: Western Canada Shipyards, 5; New Westminster Construction & Engineering Co., Ltd., 5; Pacific Construction Co., Coquitlam, 2.

At one time prominent in the steel construction business, Messrs. J. J. Coughlan & Sons have, for the past year or so, given their entire attention to their shipyard on False Creek. This yard is the largest shipbuilding plant on the coast. It is equipped with four building berths which are all completely covered in. The berths are each provided with three sets of runways for travelling cranes. The covered berths make efficient work possible in all conditions of weather. Although British Columbia does not suffer from intense cold during the winter, there is enough rain to render a covered building berth a very good investment. The plate shed with the mold loft above is located west of the berths and material is handled from the shed to under the travelling cranes by trucks running on standard gauge track.

While this firm does not build their own machinery a good-sized machine shop is provided. In the machine shop the hundreds of small fittings are made, as well as the propellers, stern tubes, etc.

As originally laid out a boiler shop was included in the yard and in it the boilers for the Alaska, the first boat turned out, were built. The boiler shop was, unfortunately, destroyed by fire and the heavy hydraulic machinery, so necessary for the construction of large marine boilers, was a total loss. As it was practically impossible to replace the machinery it was decided to hand this part of the work over to the Vulcan Iron Works.

J. J. Coughlan & Sons have three boats in commission, two in the water being fitted out, one ready for launching and four in various stages of construction. Thesee boats are 427 ft. long B.P., 54 ft. mld., beam 29 ft., 9 in. mld depth and carry 8,800 tons D.W. on a draught of 25 ft., 2 in. When complete they make a very fine looking boat and are fitted up and finished in first-class shape. As a matter of fact it has



SS. WAR CHARGER AT NO. 2 FITTING OUT BERTH

been remarked by people who are able to judge and who have seen the work in both ends of the country, that the workmanship turned out in British Columbia is superior to that of the East, both in regard to hull and engine and boiler work.

The engineer's accommodation is located on the after end of the bridge deck alongside the engine room casing. The captain's and mate's quarters being at the forward end, in the saloon.

The deck auxiliaries comprise ten cargo and one warping winches, which are being supplied by the North Shore Iron Works, an anchor windlass and a steam steering gear. The latter is driven by a double cylinder engine and is located in the poop, being operated under telemotor control from the bridge.

The ships are all driven by geared turbines, four sets being supplied by the Kerr Turbine Co., of Wellsville, and are of the impulse type. The other six are of the Parsons type. Both types are equipped with double reduction gearing, the Parsons turbines being in two units and have astern elements in each. At rated speed and pressure the turbines give approximately 2,650 S. H. P. The propellers are 14 ft. diameter and turn up 100 revs. per minute, giving a loaded speed of 10½ knots per hour.

Steam is supplied at 190 pounds per square-inch by three boilers 14 ft., 9 in. diameter by 10 ft., 6 in. long. The boilers are operated under forced draught and are equipped with Foster superheaters, a superheat of 50 deg. F. being maintained. The forced draught outfits are supplied by the Jas. Howden Co., of Glasgow, Scotland. The fans are provided with double engines As these engines have to run at a fairly high speed for long periods, the provision of two engines enables them to be overhauled at sea. The change over can be effected in a very few minutes.

Crompton's ash hoists are employed for the disposal of ashes. These hoists raise and dump the ashes automatically through a chute leading to the ship's side and form one of the most convenient and cleanly methods of getting rid of ashes.

Single collar thrusts of the Kingsbury type are employed on the shafting, the thrust bearing being made by the Canadian Westinghouse Co.

The main condensers, containing 4,000 square-feet of cooling surface are supplied by the Wheeler Condenser & Engineering Co. They are equipped with radio-jet air extractors, circulating water being handled by a 14-in. Morris Machine Works centrifugal pump.

On completion of their present work, Messrs. J. J. Coughlan & Sons will be engaged on Dominion Government work, having secured contracts for the construction of vessels of 8,100 tons D.W.

These boats are the type "B" of the standard series. They are 400 ft. long B.P. by 52 ft. mld. beam by 31 ft. mld. depth, and carry their deadweight on a mean draught of 25 ft., 1 in. They will have a speed of 11¾ knots per hour.

The hull is divided by six water-tight bulkheads and the usual double bottom is provided, the double bottom under the machinery space having a water-tight centre-line. Accommodation is provided for a complement of 47 officers and men. Rather more than the usual care has been bestowed on the accommodation, and there is no doubt that these boats, as well as those which are being built by the Wallace Shipyards for the Dominion Government, will be a credit to Canada. The steam steering gear is located in the poop and is of the guided segment type, controlled by telemotor from the bridge. Cargo handling is provided for by ten 7-in. by 12-in. double cylinder single drum winches, the winch on the bridge deck and that on the poop deck having extended shafts carrying warping barrels. A quick warping type anchor windlass is located on the forecastle deck.

It might be mentioned that in going over modern ship specification the absence of reference to copper pipe is noticed. It used to be considered that copper was the only suitable material for steam and feed pipes. In all the boats built in British Columbia mild steel pipe has been used for these purposes, and none of it has given any trouble.

The propelling machinery is a triple expansion engine having cylinders 27 in., 44-in., and 73-in., with a common stroke of 48-in. and is rated at 3,000 I. H. P. The H. P. and I. P. cylinders are provided with piston valves and the L. P. with a double-ported slide valve.

A circular steel plate condenser, built on the contraflo principle, is provided containing 3,000 square-feet of cooling surface.



LAUNCH OF THE HELEN LYALL

The air, feed and bilge pumps are attached to the engine. The air pump being 24-in. by 24-in. and of the Edwards type. The feed and bilge pumps are each 4-in. by 24-in.

Steam is supplied by three single ended marine boilers 15 ft., 6-in. diameter by 11 ft., 6-in. long working at 180 pounds per square-inch. The boilers are operated under a system of heated forced draught. They are arranged abreast in the ship with no permanent bunker space in the stokehold below the twin deck.

The Foundation Co., of British Columbia, who established a shipyard in Victoria to build wooden ships for the Imperial Munitions Board, have recently taken over the plant of the Cameron-Genoa Shipbuilding Co. The latter plant was established to carry out a contract for six auxiliary schooners for the Canada West Coast Navigation Co.,

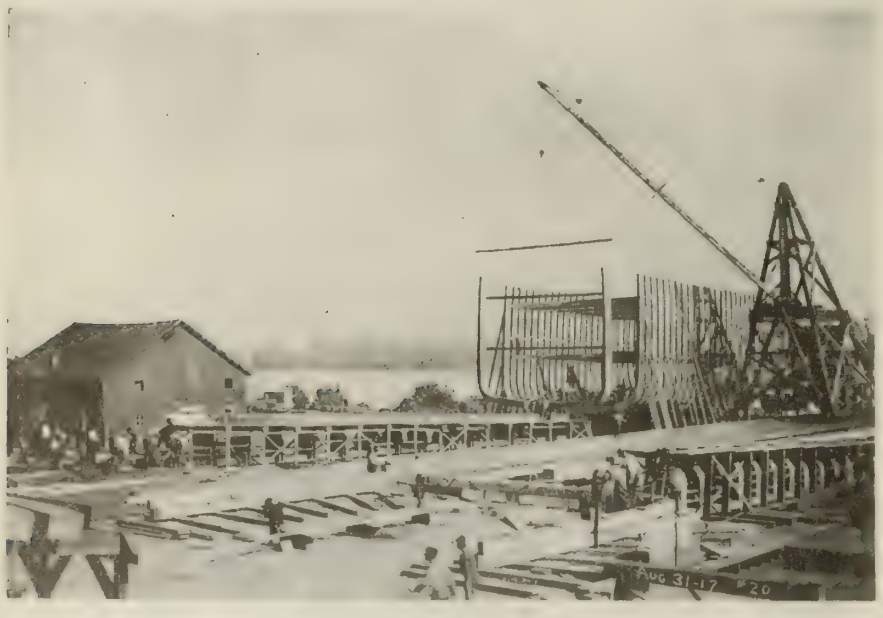


FIG. 1 WOODEN STEAMER IN FRAME

and later built several wooden steamers. It was on the completion of this work that the yard was taken over by the Foundation Co. Views are shown of one of the auxiliary schooners being built by the Cameron-Genoa Shipbuilding Co.

This yard has accepted contracts for twenty wooden steamers for French interests. The yard will be able to lay down ten of the boats at one time. The boats will carry about 2,500 tons D. W., and will be propelled by twin engines 14-in., 23-in., and 38-in by 24-in. stroke, giving a total of about 1,100 I.H.P.

The boats will be built throughout to the rules of the Bureau Veritas and that society's surveyors will also superintend the work of construction.

Yarrows, Ltd., of Esquimault, have continued turning out shallow draught stern wheel steamers for shipment to the far East. Their proximity to the Government drydock at the Navy Yard enables them to adequately handle large repair jobs. The Japanese steamer Canada Maru, which ran ashore in the Straits of Juan de Fuca, has just been repaired by them. This was a very expensive job, the cost running to over half a million dollars. The Princess Adelaide, one of the Canadian Pacific Railway Co.'s coasting passenger boats, was recently badly damaged on the rocks near Active Pass. She is at present in the hands of Yarrows, Ltd., for repairs.

Of the making of ships there is no end. Also there seems to be no end of things required to build and furnish a ship. There are very few trades which have not felt the stimulus of ship work. Winches, windlasses, ash hoists and all kinds of similar machinery can be seen in the various smaller machine shops, being made for local use and also for export.

The North Shore Iron Works have recently completed export contracts for winches and windlasses and the Schaake Co. have lathes which practically never stop, being kept busy on shafting forgings sent up from across the International Boundary and returned in a completed state for use in Uncle Sam's ships.

Whether British Columbia can continue in the steel shipbuilding business when competitive conditions are restored is a question often asked. There are only two reasons for an answer in the negative.

The logging camps and lumber mills are working full blast getting out material for wooden ships. As long as steel, which is, of course, the logical material for shipbuilding, remains difficult to obtain, wooden ships will be built and British Columbia is the right place to build them. A lot of adverse criticism was levelled at wooden ships when the idea of building them was first promulgated. Properly designed and built and reasonable care taken to prevent attacks of dry rot from the inside and of the torpedo from the outside, there is no reason why the ships that have been built and those that will be built should not have a long and useful life and be a credit to their constructors.

The enormous freight bill entailed by the rail haul from the Eastern States, where the bulk of the raw material is produced is a big item in the cost. This can be got over in two ways. There are large deposits of iron ore in British Columbia, there is lots of coal and limestone. Can British Columbia produce her own ship plate? In a very short time ship plates will be rolled on the Eastern Canadian seaboard and a considerable reduction in the freight bill ought to be obtained by shipping the material via Panama. This might prove a profitable cargo for the ships now being built for the Dominion Government.

The second item to be overcome is the higher cost of wages in the West. To overcome this perhaps the best solution is to give more for the wages paid. Not only the workman but every man in the yard, from the management down, must give an intelligent and co-operative day's work. By producing more the cost of production will be reduced. If we are to keep our yards going we must be prepared to offset the higher cost of labor by more efficient work. If we can do this we can compete successfully.

HUNS BUILDING PEACE SHIPS

That the great maritime nations lately at war with Germany, and bitterly mindful of the injuries which they have suffered at German hands, should possibly have influence in determining the scope and conditions of Germany's maritime activities, is left entirely out of account (by the Germans), says the *Morning Post*, in a leading article. That is evident from the amount of tonnage that is being turned out of the German yards month by month; and the record is certainly a tribute to German resources after four years of war.

All the big lines are building huge vessels, on a scale that suggests that in the German shipyards there is no lack of either material or labor.

For instance, it is known that the Hamburg-Amerika Line is now building at Hamburg one vessel of 56,000 tons, another of 20,000 tons, and three others of over 20,000 tons. The North German Lloyd Stettin, is building two vessels of 35,000 tons, and more than a dozen others of 12,000 tons or over; and a similar record of activity comes from other shipyards.

It is estimated that at the present time very nearly a million tons of new shipping of the most efficient type is under construction in Germany; so that, with the restoration after the war of the shipping now interned in neutral ports, or in the hands of enemy powers, Germany would enter on the competition for overseas trade in a decidedly advantageous position.



VIEW IN YARD OF THE CHOLBERG COMPANY

The Cholberg Shipyards at Mud Bay, Victoria, B.C.

Old Indian Reserve Now a Shipyard—Building Wooden Sailing Vessels—To be Rigged as Barquentines — The Construction of These Vessels Shows Exceptional Strength — Some Large Contracts Are in Sight

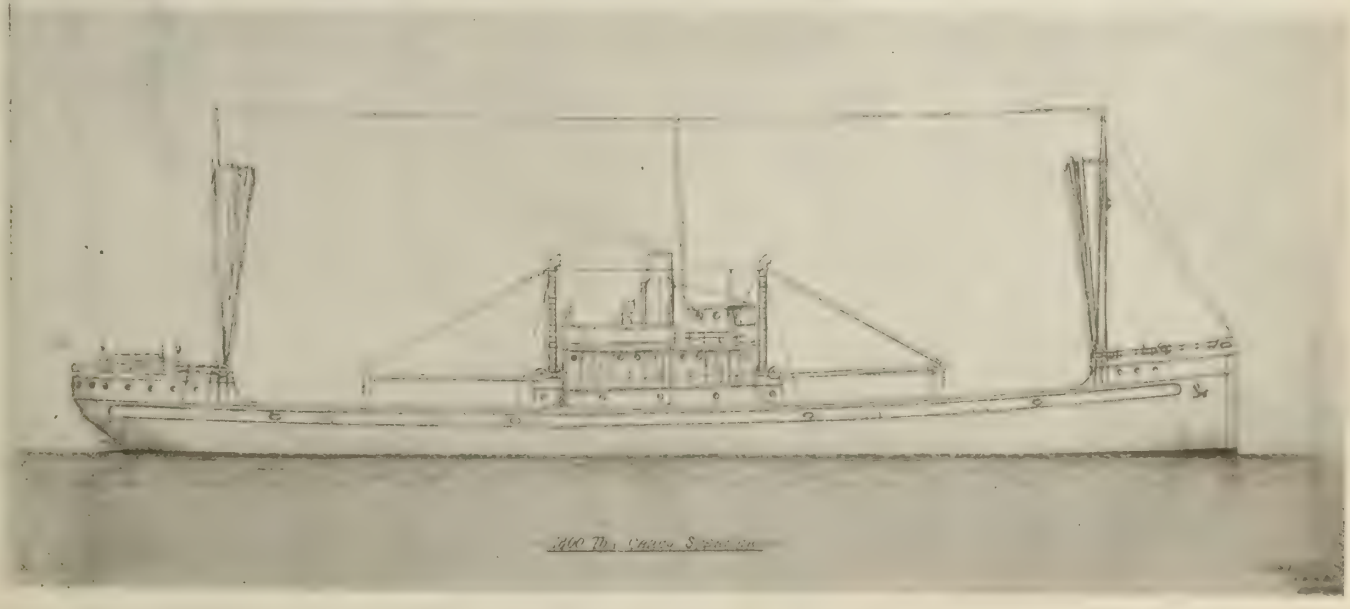
AVALANCHES, it is notorious, play curious tricks in their headlong descents, and the war, which was, in effect, an industrial avalanche, quite lived up to traditions of its family. None of its vagaries was more strange, however, than that which turned an ancient Indian reserve into a Twentieth Century shipyard and brought a modern descendant of the old-time vikings to build staunch vessels of Douglas fir for his fellow-countrymen on the far-away coast of British Columbia.

Was the Home of the Redman

A dozen years ago, or even less, a large and valuable section of the townsite of Victoria was taken up by the Songhees Reserve. The area was an unprofitable one and a source of worry and dissatisfaction to the citizens, who did not rest until the Indians were bought off and moved to a less conspicuous spot. To-day, that section of the old reserve fronting on Mud Bay, a portion of Victoria's inner harbor, is occupied by the Cholberg shipyard, and some 230 men are busily engaged on the construction of wooden schooners. Where once only dug-out canoes lined the beach, the traveller may now see the ribs of ocean-going vessels rising; the redman's fires have given place to the blacksmith's forge; and the staccato beat of the air-hammer keeps the place lively all day long.

The Builder of the Ships

Chris. Cholberg, the head of this new industry, is a young Norwegian who has built ships almost round the world. He learned his craft in his father's yards at Molde, Norway, and afterwards spent eighteen months at Sydney, Australia, building small schooners of hardwood. Since 1905, he has been on the Pacific Coast. He builds his ships solidly, in the good old Norwegian way. They will have rough and heavy work to do, he knows, and it is his aim to make them fit for it. In this, he admits he is a bit old fashioned, but is proud of the fact. He has no ambitions to make records for quick launchings, but insists that as much time be given each hull as will make it solid and serviceable. Factory methods, which call for the greatest possible output in the shortest possible time, have no place in a shipyard, he declares.



1 800-TON CARGO STEAMER BUILDING BY THE CHOLBERG YARDS

Three Vessels Building

Work was begun in the Mud Bay yards in September last, and three ships are now on the stocks. The first, to be known as the Washington, will probably be launched about the end of March. The Washington and the Vancouver, the third hull to be laid down, are being built to the order of Capt. H. C. Hansen of Porsgrund, Norway, while the second of the trio is being constructed for the Porsgrund Demp und Seil Company of Norway. All three vessels are of the same type, 1,500 tons deadweight, 185 ft. long between perpendiculars, 44 ft. extreme beam, and 19 ft. 2 in. moulded depth. It was intended at first that they should be four-masted schooners, but it is probable, now, that the Washington and the Vancouver will be barquentine rigged. The vessels will all be electric lighted and will carry donkey boilers for handling cargo and gasoline engines for hoisting sails and working the pumps.

The vessels are being built to the requirements of Lloyds and the Norske Veritas and have been given A1 classification for twelve years by Lloyds. The plans were approved by Lloyds and returned to the builders without alteration. As already stated, the Cholberg ships are strongly built. Each, for instance, has seven keelsons and the height from the shoe to the uppermost keelson is ten feet. Added strength is given by a new system of keying, the invention of Mr. Cholberg himself, for this young builder is in no way old-fashioned when it comes to the adoption of new means for securing the staunchness to which he pins his faith. By the new invention, the keelsons and the side-ceiling are securely locked together. The bolting is exceptionally heavy, too, 120 tons of fastenings being used in each vessel.

Douglas fir from the Vancouver Island mills is the material employed and each faying surface is thoroughly creosoted. The knees come from Port Alberni, on the west coast of the Island, and are largely from second-growth Douglas fir. The treenails are hickory and come from eastern United States.

An 1,800 Ton Steamer

The Cholberg yard has only three ways at present, but there is plenty of room for expansion and the management is figuring on five more berths as contracts are in prospect for wooden ships from Norwegian, English, Chinese and Greek interests. An 1,800 ton wooden steamship for ore-carrying has already been designed and may be laid down shortly. This ship will be 218 feet long over all, with 40 feet extreme beam and 20 feet moulded depth. There will be two-cargo holds, with two hatches to each hold and eight winches. The engine will be placed amidships, and the derrick masts amidships will also be steel ventilators.

An entirely new type of bottom construction will be adopted in this steamer. The moulded height of the main keelson is to be carried out until it intersects with the side ceiling, and, instead of a limber-strake there will be a four-inch lead pipe in every frame bed to give access to the limbers. The inside will be calked tight and the ship will thus virtually have a double bottom. The steamer will be equipped with two 12 ft. x 9 ft. Scotch marine boilers and a 650 horsepower triple-expansion engine. The bunker capacity will be 300 tons, the coal consumption nine tons a day and the speed ten knots an hour, loaded.

The timber for the Cholberg ships is brought to the yards in rafts or on scows. From the scows, a derrick-scow unloads it while from the rafts a winch drags it up a slide, as it is required, to the planer. Thence, if necessary, it passes to the saw mill or goes to the construction gang on the hull. The machinery of the yard consists of two band-saws, a timber-sizer, a tree-nail machine, a turning lathe and jointers and planers. In the blacksmith shop are bolt cutters and an air hammer. So far, no gantry cranes have been used, but it is intended, later, to put in a sky-line. All the power used in the yards is electric.



STAFF OF THE CHOLBERG YARDS

The Lang Cove Plant of Yarrows, Ltd., Victoria, B.C.

Associated With the Famous Firm of Yarrow & Co., Glasgow—Large Marine Railway and Dry Docks—Have Built Several Ships Besides Carrying Out Large Repair Operations

THE firm of Yarrows, Ltd. (who are associated with Yarrow & Co., Ltd., of Glasgow), have an extensive plant at Lang Cove, Esquimalt Harbor, near Victoria, B.C. Their yard, which occupies an area of eight acres, is especially equipped to cope with ship repair work, and the facilities of the plant have been steadily improved and added to since the coming of Messrs. Yarrow in 1914.

The Yard and Marine Railway

The yard has an up-to-date machine shop, boiler shop, joiner shop, pattern shop, coppersmith and pipe shop, foundry welding plant and galvanizing plant. Its wharf, which is 600 feet in length and can accommodate vessels on both sides, is fitted with electric power, compressed air and water and has shearlegs capable of lifting 60 tons. There is also a floating crane of ten tons capacity and a floating compressed air plant and other equipment.

The marine railway in connection with the yard can accommodate vessels up to 315 feet long and 3,000 tons displacement. Larger vessels, up to 480 feet in length, are docked in the Esquimalt drydock nearby.

Several vessels have been built at the Lang Cove plant, including the "Princess Beatrice" of 1,289 tons gross, the "Princess Royal" of 1,996 tons gross, the "Princess Maquinna" of 1,850 tons gross, the tug "Nanoose," two large steel transfer barges for the C. P. R. coast service, and two small steamers for the Dominion Government.

The firm have recently completed an order for five steel sternwheel river steamers for India. Four of the steamers were 135 ft. x 32 ft. x 4 ft. 9 in., and one was of larger dimensions, 165 ft. x 35 ft. x 7 ft. All five steamers were built in the yards on horizontal ways. Instead of being launched, they were "knocked down," packed in packing cases and shipped by steamer to Hong Kong and thence to India. They are now plying on the Irrawaddy and other rivers of Burmah.

Some Interesting Repairs

In their five years' tenure of the yards, Messrs. Yarrow have carried out a large number of extensive repair jobs, and, in addition to their merchant work, have carried out many important naval refits for the Imperial, Canadian and Japanese navies. Following is a short description of a few of the recent repair jobs:

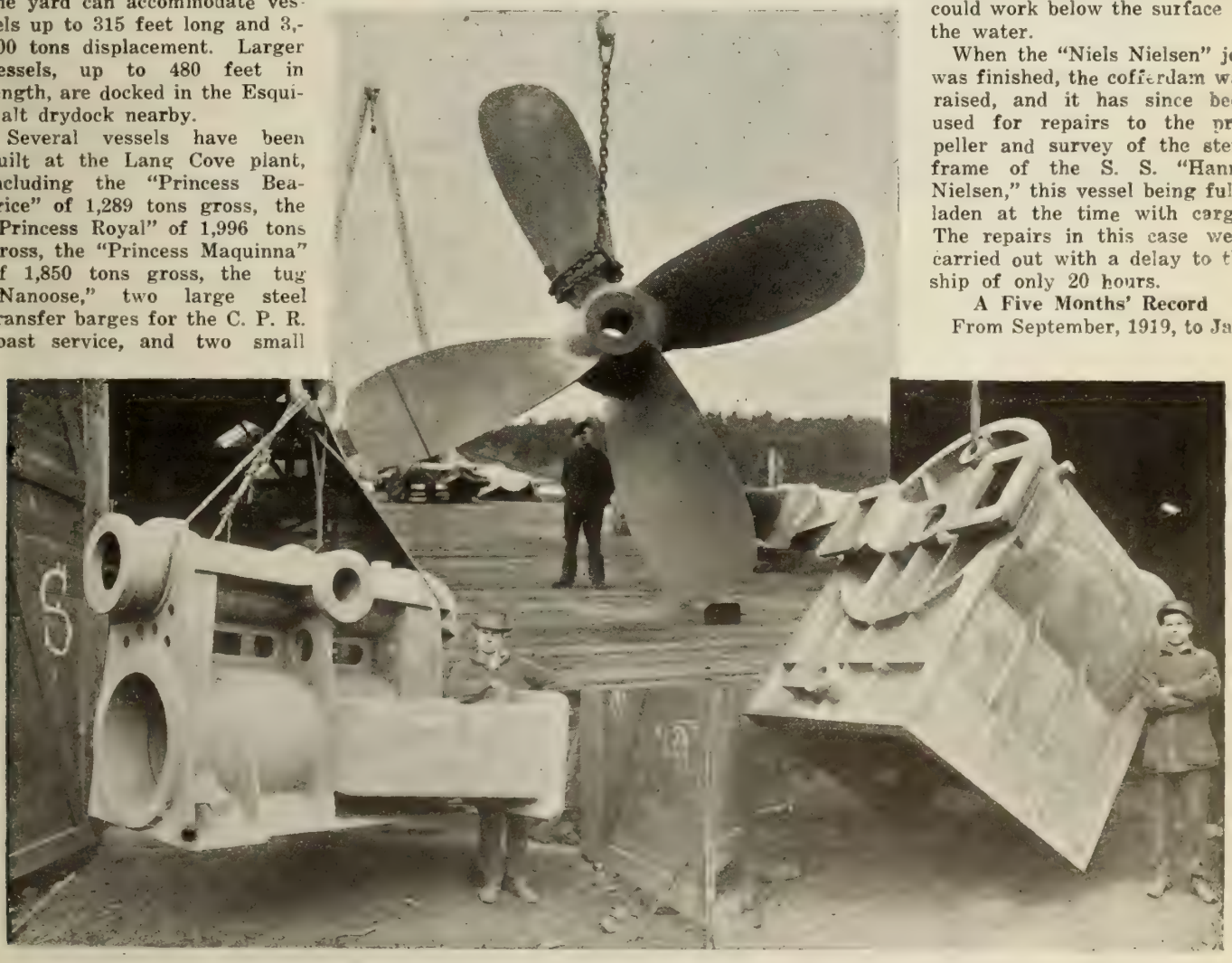
The S. S. "Prince Rupert," which went ashore at Genn Island, sustaining very extensive damage, was repaired in six weeks, the work necessitating the renewal of practically the whole of the ship's bottom, including frames and floors for a length of 180 feet, the straightening up of the ship, the complete overhaul of the main engines and auxiliaries and the renewal of both tail shafts.

Another notable case was that of the "Niels Nielsen," a fully laden cargo vessel of 8,800 tons, which was brought back from sea in a disabled condition and fitted with a new propeller, 18 feet in diameter and with manganese bronze blades. This propeller was cast, fitted and the ship made ready for sea in eight days, without docking or disturbing the cargo, the work being carried out by building a cofferdam round the vessel's stern. The cofferdam was built of wood, launched and towed out to the vessel and placed under the stern. The water was then pumped out, making a compartment in which the men could work below the surface of the water.

When the "Niels Nielsen" job was finished, the cofferdam was raised, and it has since been used for repairs to the propeller and survey of the stern frame of the S. S. "Hanna Nielsen," this vessel being fully laden at the time with cargo. The repairs in this case were carried out with a delay to the ship of only 20 hours.

A Five Months' Record

From September, 1919, to Jan-



CAST IRON PROPELLOR, HIGH AND LOW PRESSURE CYLINDERS.



SS. "CANADA MARU" NO 1 HOLD.

uary, 1919, Messrs. Yarrow have carried out a number of repairs, the total gross tonnage of the vessels amounting to approximately 80,000 tons. As a matter of fact, the tonnage handled was considerably greater than this, as some of the vessels were docked more than once. Following is a summary of the repair work for the five months mentioned:

S. S. "El Lobo" (4,800 tons) Docked and very extensive repairs carried out to both hull and main engines.

S. S. "Princess May" (9,500 tons) Docked for cleaning and painting; new tail and crank shafts fitted and extensive repairs to starboard main engine carried out.

S. S. "Swell" (85 tons) Docked for cleaning and painting; new tail shaft fitted and stern bush bored out.

S. S. "Tees" (679 tons) Minor repairs.

S. S. "Prince George" (3,379 tons)-Docked for cleaning and painting and repairs to propellers, etc.

S. S. "War Tatla" (2,320 tons) Docked for cleaning and painting and sundry machinery repairs.

S. S. "War Camp" (5,610 tons) Docked for cleaning and painting.

S. S. "Princess Royal" (1,996 tons) Docked for cleaning and painting and repairs to propellers, etc.

S. S. "War Babine" (2,320 tons) Docked for cleaning and painting, caulking and tightening up propeller, etc.

S. S. "Canada Maru" (5,760 tons) Docked and very extensive repairs carried out to bottom damage; repairs necessitating removal of 145 shell plates and the entire double bottom from the stem to the engineroom bulkhead. Main engines, boilers, auxiliary machinery, shafting and propellers given thorough overhaul.

S. S. "Bromela" (2,50?) tons) Repairs carried out to main engines, feed pumps etc.

S. S. "War Tyee" (2,300 tons) Docked for cleaning and painting, caulking and under-water work.

Tug "Hope" (78 tons) Docked for cleaning and painting and repairs to propellers.

S. S. "Quadra" (1,366 tons) Overhaul and repairs.

S. S. "War Sumas" (2,320 tons) Main engines, auxiliary machinery and boilers installed, and vessel docked for cleaning and painting, etc.

S. S. "Princess Adelaide" (3,061 tons) Docked for survey and temporary repairs and afterwards repairs carried out to very extensive bottom damage due to stranding. Main engines, shafting and auxiliary machinery receiving complete overhaul.

H. M. S. "Lancaster" (9,800 tons) Refit carried out to main engines, auxiliary machinery, alterations to magazines and additions to armament.

S. S. "War Nanoose" (2,320 tons) Docked for cleaning and painting, caulking and under-water repairs.

S. S. "Princess Charlotte" (3,844 tons) Repairs carried out to main feed pumps.

S. S. "Canora" (2,383 tons) Docked for cleaning and painting and extensive retensive repairs to main engines, tail shafts, etc.; guns and smoke screens dismantled.

S. S. "War Charger" (5,830 tons)-Repairs carried out to main turbine and main feed pumps.

S. S. "War Chief" (5,830 tons) Docked for cleansing and painting and repairs to bottom damage.

S. S. "Prince Rupert" (3,379 tons) Docked for cleaning and painting and repairs to main engines and propellers, etc.

Aux. Schooner "Justice" (2,126 tons) Repairs carried out to boiler.

Aux. Schooner "Souchez" (2,126 tons) Extensive repairs carried out to main engines.

Some Large Castings

During the past few months, Messrs Yarrow, Ltd., have been making a large number of interesting castings. Thirty cast iron propellers, 14 ft. 6 in. diameter, and weighing about seven tons each, have been delivered to the Imperial Munitions Board for use on the wooden steamships turned out by the various British Columbia yards. In addition, the firm has produced a large number of marine engine castings, consisting of H.P., I.P., and L.P., cylinders and bedplates for engines 24 in. x 38 in. x 62 in. x 42 in. stroke.

Quite a number of H. P. cylinder castings have been made by Messrs. Yarrow



JAPANESE STEAMER "CANADA MARU."

for vessels of the United States Emergency Fleet Corporation, these castings being turned out at the rate of two a month and weighing approximately 6½ tons each.

Several large cast iron nitric acid retorts have been made in one piece, weighing about eight tons. These retorts were 12 feet high by 6 feet inside diameter.

A very large number of manganese bronze propeller blades have been made by Messrs. Yarrow for various vessels. Four of these blades, each weighing about 3,500 pounds, were cast, machined and ready for installation in the short space of five days. This performance was very creditable as no previous preparations had been made, the job being for an emergency breakdown.

It is interesting to note that extensive refits and repairs have been carried out by the firm, to the following war vessels:

H.M.S. "Kent."
H.M.S. "Newcastle" on 3 occasions.
H.M.S. "Lancaster" on 3 occasions.
H.M.S. Aux. Cruiser "Otranto" on 2 occasions.
H.M.S. Aux. Cruiser "Avoca" on 2 occasions.
H.M.C.S. "Rainbow."
H.M.C.S. "Shearwater."
Submarines C C 1 and C C 2 docked and refitted on several occasions.
H.I.M.S. "Idzume," refit carried out to main engines.



SS. "CANADA MARU" FORE PEAK WITH STEM REMOVED.

TUNGSTEN FILAMENTS

A new lamp filament patented in Germany recently consists of a single long crystal of tungsten instead of the usual irregular string of crystals and has in consequence greatly increased strength and durability. The ordinary filament is produced either by hammering fine tungsten powder into lumps, and drawing or rolling, or by squirting a mixture of the powder with a binding material and then sintering. In the new process very finely divided tungsten acid is freed from its oxygen by heating in an atmosphere of hydrogen; the powdered metal so produced is mixed with a definite quantity of therium oxide and a small amount of a colloidal binder: the paste is squirted under pressure through fine dies; and the filaments, after gentle drying, are finally passed through a forming or structure changing apparatus. This apparatus is a glass cylinder, closed and air-tight at top and bottom, containing a spiral of several turns of tungsten wire heated by electric current. In a stream of reducing gas eight filaments at a time are passed at the rate of about 8 ft. an hour, and the sudden and continued heating to 2,600° or 2,700° C., has the effect, as shown by the microscope, of joining the large number of crystals of each filament into one long crystal. In tests of 1,200 hours the filaments have shown no change, retaining great strength and freedom from cracks on bending, with no blackening of the lamp bulbs.—M. M.



SS. "PRINCE GEORGE" ON MARINE RAILWAY.

Building Wooden Ships at the Lyall Yards

A Substitute For Steel—How the Wooden Ship Industry Was Commenced—Yard Stands on Made Ground on Burrard Inlet—The Building Berths—Handling the Raw Material

ON more than one occasion in the world's long history, wooden ships have played their part in winning or maintaining the liberties of mankind, and recent events have gone to show that they are still to be depended upon. The wooden walls of Ancient Greece, Britannia's native oak and the Douglas Fir of the Pacific Coast have, in different ages, heard the call of distress and each, in turn, has responded.

The First Material

Wood was the first ship material, but the Nineteenth Century, with its passion for expansion and industrialism, enthroned steel on sea as well as on land, and it became the fashion, after a few decades, to speak disparagingly of the wooden vessels still left afloat or even to apologize for their continued existence.

This was before the war. When the war came, it quickly developed into a contest of engine against engine and machine against machine. Young, lusty, efficient steel was conscripted and hustled off to the front, and wood, the common, inglorious, much-maligned, stay-at-home drudge, found on its unaccustomed shoulders the burden of carrying on much of the business of civilization. The manner in which it rose to the occasion is one of the wonders of the great war.

The construction of wooden ships pre-supposes an available supply of suitable timber, and British Columbia's fir forests and extensive sawmills early marked the Pacific Coast Province for leadership in the new industry. Building ships of fir was not altogether an experiment. It was well known in shipping circles that the timber was suitable. Though no large vessels had been built of it, it had long been used for small craft and the tug Lorne, constructed 35 years ago, and still in first-class shape, had carried its fame round the world.

The Start of The Industry

During the first two years of the war, British Columbia's chief industry, lumbering, suffered very severely owing to the disappearance of the domestic demand, and the lack of tonnage to bear its products to markets abroad. Hoping to relieve the situation, the Provincial Government offered financial assistance to any firm which would undertake the construction of auxiliary lumber schooners. Two firms took advantage of the offer and twelve 2,500-ton vessels of this class were built, six at Victoria and six at North Vancouver.



THE CAP PALOS UNDER SAIL

In July, 1917, the yards at North Vancouver were purchased by the William Lyall Shipbuilding Company, Limited, and have, since then, been extended and improved until they are now the largest and most complete wooden shipyards in British Columbia. They occupy an area of some 22 acres on the north shore of Burrard Inlet, give employment to about 1,050 men, and have a monthly payroll of approximately $125,000. Prior to the arrival of the Lyalls, North Vancouver streets were conspicuous for the number of empty houses on them. There aren't any to be found now. Rents are up a hundred per cent. or more and hundreds of the shipyard workers are forced to find homes across the Inlet in Vancouver.

Since coming to North Vancouver, the Lyall Company has launched twelve ships of a total tonnage of 31,800. Six of these were steamers of 2,800 tons deadweight, built to the order of the Imperial Munitions Board and launched as follows: War Puget, February 12; War Caribou, April 10; War Cayuse, April 27; War Atlin, May 11; War Nicola, June 24; War Suquash, July 24. These were all vessels of the standard type, 263 feet long over all; 250 feet between perpendiculars; 42½ feet moulded beam; 25 feet moulded depth, and 21 feet draft. They are equipped with triple expansion, surface condensing engines, developing 1,000 indicated horsepower at 60 to 70 revolutions per minute. The cylinders are 20-in., 33-in. and 54-in. in diameter with a 40-in. stroke. The speed is 12 knots.

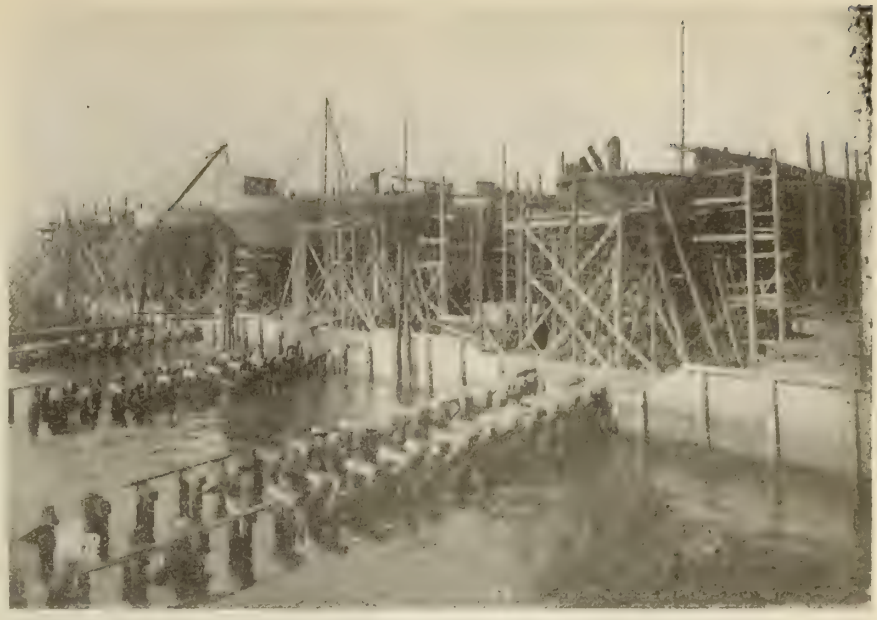
The other six ships were auxiliary schooners of 2,500 tons deadweight, constructed by the firm on its own account and later sold to a Belgian syndicate. These vessels were launched as follows:—J. N. Greenshields, September 24; Alice Beauclerk, October 15; Helen Lyall, November 6; Cap Finisterre, December 2; Cap Vert, December 14; unnamed vessel, December 31. The dimensions of these ships are: length, 258 feet over all and 225 feet between perpendiculars, beam 44 feet and draft 20 feet. The schooners are fitted with two 160 horse-

power oil engines each, capable of developing a speed of eight knots an hour.

Six vessels of a new series are now on the stocks. These are little steamers of light draft which are being built to the order of the French Government for carrying coal between Cardiff and the French coast. They are 195 feet in length between perpendiculars, with a 39-foot beam and a depth of 17 feet. The draft is 16 feet and the deadweight carrying capacity 1,500 tons. Contracts have been signed for eight of these steamers and the keels of the remaining two will be laid as soon as the first ones are launched.

The Lyall Shipyard

The Lyall shipyard occupies a stretch of filled-in or "made" ground on the north shore of Burrard Inlet and as the work goes on, vessels pass by in front of it, to or from the various ports of the Orient and the Antipodes. Across the Inlet, a mile or so away lies the city of Vancouver, with the forest-clad peninsula of Stanley Park guarding its harbor entrance. Back of the yard (to the north) runs the Pacific Great Eastern Railway, and work trains on this road, night and morning, carry the workmen between the yards and the ferry to Vancouver. On the other three sides, east, south and west, the yard has a water frontage. The building berths, six in number, are placed at the extreme south side and launching ways run from the berths to the water. The berths are placed in pairs and between the two berths of each pair is a travelling derrick with a capacity of 15 tons and a boom long enough to handle material on either side of either ship. The derrick track runs the full length of the berth, and the derrick can work at any point along the track and can pick up material at either end. The plan is an ingenious one and has proven a money-saver, for although it only allows one derrick to each two ships, the derrick is so easily and quickly moved that it can accomplish an unusual amount of work with a single crew. Waste time is reduced to a minimum.



LYALL YARDS FROM THE SEA.

The Raw Material

Lumber and timber of various dimensions is, of course, the principal material which enters into the construction of the Lyall ships, and this is brought to the yard in scows which unload at the west side of the fill. The material is unloaded by a travelling derrick and is transferred by means of a car or an overhead cableway (sky-line) to the sawmill. The six berths occupy a space about 416 feet in width and the sawmill is just north and west of the most westerly berth. Two derricks stand to the west of the mill for the handling of heavy timbers.

In an industry of this magnitude, it is necessary, of course, to work according to a well-defined plan. The material is, therefore, prepared well ahead of the demand for it at the building berths, and when it leaves the mill, after being planed or sawed, it usually finds its way to the stockyard. Many pieces require to have further work done on them, and these pass, with the assistance of another travelling crane, to the fairing stocks, which stand behind (north of) the three most westerly berths.

East of the fairing stocks is the blacksmith shop, and east of this again is a building containing a paint shop, joiner's shop and treenail shop below and the mould loft above. Farther east still is the storehouse and beyond this, and close to the eastern extremity of the yard, the office. North of the blacksmith shop is the oakum building, with the Red Cross ward adjoining, and the boiler house beyond. This Red Cross ward, by the way, is not often used, for Safety First is the rule in the yards and accidents are few and far between.

There is a great deal of waste in the sawmill and such of it as can be turned into usuable material is sent to the re-sawmill, which stands close by. From the sawmill and re-sawmill and from the treenail and joiner's shop refuse pipes run to the boiler house. If there is more refuse than the furnaces require, a special pipe will carry the excess to a burner far back from any of the buildings.

Every wooden ship requires about 225 knees and these are cut mostly from Douglas Fir roots on the hills back of the yards. They are delivered in rough state in the yards and are shaped in a special knee dresser. The contractor is paid according to the thickness of the knee when dressed. The price runs from $8.00 for the smaller knees to $25.00 or more for the larger ones.

The Riggers and Fitting-out Dock

The auxiliary schooners building in the ways require enormous spars and these are shaped and dressed in a rigger's shop close to the east side of the yard. Close



CORNER OF THE LYALL YARD.



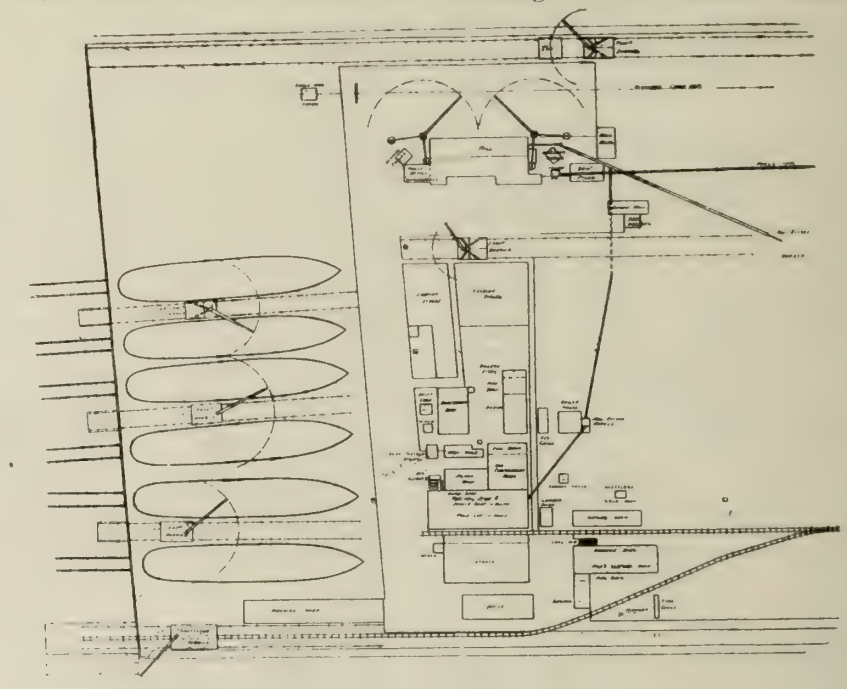
THE SIX SLIPS OF THE LYALL YARD.

by the shop runs a switch line from the Pacific Great Eastern Railway, and on this the engines, boilers and tanks for the ships and tons of other stores are brought in.

A new fitting-out dock, 500 feet long and 40 feet wide, has just been completed at the south-east corner of the shipyard. It can handle four ships at a time and has facilities for assembling engines, and a fifty-ton travelling derrick for lifting engines, tanks and boilers and for stepping masts. A new and up-to-date plant for engineering work has also been installed recently, close to the outfitting pier. All the wood-work, forging and machine work required in building and outfitting the ships is done on the ground, but boilers, engines, winches, tanks and life-belts are brought in from outside. It is the company's aim, eventually, to build its engines as well as to install them.

The Company

The Lyall Company is a Montreal concern. Its president is William Lyall of Montreal, and its directors, J. N. Greenshields and H. W. Beauclerk. The active operating head, however, is W. S. D. Cook, to whose energy and organizing ability the success of the enterprise is, in no small part, due. Mr. Cook has announced that his company is at North Vancouver to stay and he is understood to have plans for further expansion. These are stated to include a drydock for ship repair work and the conversion of the plant into a yard for the construction of steel ships when circumstances shall warrant the change. As for wooden shipbuilding, he is convinced that the industry will not die for a couple of years yet, at least. The demand for tonnage is keen and growing, and as steel is required urgently for a myriad of purposes other than shipbuilding there is no likelihood that there will be any excess supply of ship plates for some years. The steel ships will not be forthcoming and as the demand cannot brook delay, wood, he believes, will have to be used in increasing rather than diminishing quantity.



PLAN OF YARD



SIX SHIPS ON THE WAYS.

"WIRELESS LIGHTHOUSES" FOR FLYING PILOTS

At present, the weather is the great natural enemy of aviation, but before long it will be fully conquered. Two things are needed for victory. One is the multiplication of meteorological stations so that aviators may have foreknowledge of the weather conditions they are likely to meet on long flights. The second is the use of direction-finding wireless apparatus. This apparatus is a British war-product and is at present a secret, but we shall soon learn all about the means by which British inventors were able to provide aircraft with instruments which indicated the distance and direction of wireless stations on land. Aircraft so equipped can fix their position frequently, can report to their base at any moment where they are, what course they are steering and whether they are in any difficulty. Thus the Imperial "wireless chain" will be an indispensable factor in the organization of long-distance flying. The direction-finding wireless instruments will, of course, be of great value to shipping in foggy weather or when the clouds prevent the steering of a course by the stars.

SIR JOSEPH MACLAY SPEAKS

The armistice was signed only a short time ago, but the interval has made a striking difference in the amount of shipping released for the ordinary purposes of commerce. The position, as is obvious, is yet very far removed from the normal pre-war conditions of the shipping world, and the shipyards will be busy for months, indeed for years, before the war losses are all made good. Still, as compared with the beginning of November, a remarkable transformation has been effected in the carrying of commodities to supply the needs of the British Isles, both in regard to foodstuffs and to raw material for trading purposes. Free shipping and ample supplies of coal are the key to our industrial position.

This, in general terms, was the view of Sir Joseph Maclay, Bart., the Shipping Controller, expressed to a representative of the Press Association.

"The termination of hostilities," said Sir Joseph Maclay, "has eased enormously the shipping position. The shipments of munitions have ceased. Our merchant cruisers have been released for the merchant service fleet, and the coaling vessels have been demobilized. Numerous craft of all kinds, previously engaged in naval and military work have been made available for bringing supplies to this country, and the removal of naval restrictions has meant a great speeding up of merchant shipping. The immediate effect of all these things is to increase the tonnage available for the bringing of imports to these islands by something equivalent to 10 million tons of goods per annum. The shipping losses having ceased, and the output of tonnage continuing to increase, the position grows easier day by day.

"We are returning liners," the Shipping Controller proceeded, "to their pre-war routes to bring the accumulations of cargo which are badly needed in this country (and which, during the war, though in many cases already bought and paid for, had been left behind in order to concentrate shipment on the nearer but much dearer market of North America), and to take up the trade connections which were necessarily sacrificed in the interests of the effective prosecution of the war. The time is not far distant when it will be possible to release tonnage from requisition on a substantial scale, and thereby create a free market in tonnage and freight. Already the amount of space available for commercial cargo in the North Atlantic has been doubled, and instead of cargo competing for space, space is now competing for cargo."

Asked as to the future of British shipping, Sir Joseph Maclay answered. "In spite of our very heavy losses, we have no reason to think that British shipping will not be fully equal to the demand likely to be made upon it. The great need of the moment is coal for export. On our coal exports the whole of our shipping and financial position depends. We hope that with the release of miners from the army it will not be long before the ships which now have perforce to go out in ballast can take outward cargoes, thereby at once relieving our financial situation and reducing the cost of our imported supplies. Our shipping is not by any means normal in its extent, but we are aiming at restoring the old conditions and getting rid of vexatious restrictions. I say again that free shipping and ample supplies of coal are the key to our industrial position."



VIEW OF YARD SHOWING CRANE.



THE UNLOADING BERTH, LYALL'S YARD.

Chicago—The old scheme for converting the Chicago drainage canal into a deep water canal has been revived by the Chicago *Daily News*. Chicago has for a long time been desirous of securing a canal to connect Lake Michigan to the upper waters of the Mississippi, which would give them direct connection by water with the Gulf of Mexico and the Atlantic Ocean. The objection of the Governments, both Canadian and United States, to the scheme, is that it would interfere with navigation on the lower lakes, and affect very adversely the many hydro-electric propositions on the St. Lawrence.

The Wallace Shipyard, Limited, North Vancouver

The Pioneer Steel Shipbuilders of the Canadian Pacific Coast—An Old-time Industry—Ships Built For Imperial Munitions Board — Others Building For Canadian Government New Merchant Fleet

TO build ships is one thing. To build up a great shipbuilding industry is quite another matter. Both are being done simultaneously by the Wallace Shipyard, Limited of North Vancouver, B. C. This firm was the pioneer in steel shipbuilding on the Pacific Coast of Canada and to it belongs the honor of having launched the first steel cargo carrier built in the Dominion west of the Great Lakes. From the first, success has attended the efforts of the firm and "Expansion" has, all along, been its watchword. Mr. Andrew Wallace, the moving spirit in the enterprise, who celebrated his 53rd. birthday early in December, states that his goal will not be reached until he is able to turn out a steel freighter every three months.

An Old Industry

Shipbuilding, in a way, is a very old industry in British Columbia, for, as long ago as the spring of 1788, Capt. John Meares laid down the keel of a tiny wooden schooner, the "Northwest America," on Nootka Sound. The little ship, of fifty tons burden only, was launched on Sept. 20 of the same year, the first home-built craft to sail the waters of the North Pacific. During the next century and a quarter, nothing larger than fishing-boats, tugs and ferry boats, with an occasional wooden schooner, was attempted on the British Columbia coast. Then the great war came and with it the demand for tonnage created by the destructive tactics of the Germans. The Wallace shipyards were quick to see the need, and with commendable enterprise, pioneered the way, and, in the summer of 1916, the keel of their first steamer was laid. This craft, the "War Dog," was launched on May 17, 1917, and was taken over by the Imperial Munitions Board. Two other ships followed, the "War Power," launched in March, 1918, and the "War Storm," launched in September last, and these were also taken by the Munitions Board.

The New Ships

The three ships were all built from the same plans. They are 300 feet long, by 15 feet moulded beam, by 27 feet moulded depth, and have a carrying capacity of 4,700 tons each and a speed of ten knots an hour. They were equipped with triple expansion engines, the cylinders being 24-in., 38-in. and 62-in. with a 45-in. stroke and developing 1,650 indicated horse-power. Each ship has two boilers of the Scotch marine type, 15 feet, 6 inches in diameter by 11 feet 3 inches in length, carrying a pressure of 180 pounds. The machinery installation represents the best practice in cargo-boat propulsion. All pumps are independent of the engines and the condensers are built on the contra-flow principle.

Two other ships are under way in the yards now, both for the new fleet of carriers to be owned and operated by the Dominion Government. One of these is almost ready for launching, and the keel of the other was laid early in December. These ships are to be 320 feet in length by 44 feet moulded beam, by 25 feet moulded depth and will have a carrying capacity of 4,300 tons on a draft of 21 feet 2 inches. The speed will be 11½ knots an hour. The ships will have triple expansion engines with cylinders 25-in., 41-in. and 67-in. in diameter and



ANDREW WALLACE.

a 45-in. stroke. Air feed and bilge pumps will be driven off the low pressure engine. The two boilers will be of the Scotch marine type, 15 feet 6 inches in diameter, by 11 feet 6 inches in length, and pressure of 180 pounds. They will be equipped with Howden forced draft.

The Wallace Shipyards have contracts for two additional ships for the Dominion Government fleet. These will be larger vessels than any so far built in the North Vancouver yards and will have a carrying capacity of 5,100 tons. They will be 331 feet long, by 46 feet, 6 inches moulded beam, by 25 feet, 6 inches moulded depth. Their engines will be triple expansion, having 25-in., 41-in. and 68-in. cylinders with a 45-in. stroke, yielding 2,500 indicated horse-power and driving the vessel at a speed of 12 knots an hour. The boilers will be 14 feet in diameter, by 11 feet 6 inches in length, and 180 pounds pressure and will be operated under forced draft.

The Shipyard

The Wallace Shipyards lie on the north shore of Burrard Inlet, the extensive, land-locked stretch of water which forms the principal portion of Vancouver's harbor. Behind the yards, on the terraced hill-side, lies the city of North Vancouver, and farther back still rise the wooded slopes of Grouse Mountain, one of the lesser peaks of the Coast Range. Directly across the inlet, and connected with the north shore by ferry, is the down-town section of Vancouver.

Vancouver is little more than thirty years old, and Andrew Wallace has been a prominent figure in the city's industrial life for a good deal more than half that time. Many years ago, he established a yard on False Creek for the construction of fishing boats for the Columbia River. A ship repair plant followed, and when this outgrew its quarters on the south side of the Inlet, a move was made to North Vancouver, and the marine railway there became the pioneer industry of the new city. When the demand for tonnage became acute in 1916, the Wallace Shipyards undertook the construction of both steel and wooden vessels, but the wood plant, after the construction of about half-a-dozen schooners, was sold to Lyalls of Montreal, and is now being operated by them.

The yards where the steel ships are built have recently been improved and extended. New methods have been adopted and new and more efficient systems of handling material worked out. As stated already, the yard fronts on the north shore of Burrard Inlet. To the west is Lonsdale avenue, the principal street of North Vancouver. Next to the street and just above the high-water-mark are three building berths, capable of taking vessels up to 400 feet in length. East of the berths is the repair plant, consisting of large and small ways with the machine shop between. Running south from the machine shop and extending several hundred feet into the Inlet is the fitting-out wharf, with a 100-ton sheer-legs on the outer end. The small ways are east of the machine shop, and east of these again, and at the extremity of the yard, is a barge slip and the stock-yard. At the rear of the stock-yard are the furnace-sheds, with two oil-burning furnaces, one for plates and one for angle-bars, and the bending "slabs" for setting plates and angle-bars. In the rear of the machine shop, and really a part of it

is the smithy, where the great and small forging is done, and back of this, again, is the carpenter shop with the pattern and cabinet shop above. This building is at the extreme north side of the yard. West of it, and also at the extreme north



STEEL FREIGHTER ON WAYS.

side of the yard, is the new plate shed, with the mould loft above. This building is just back of the three berths.

The Stock Yard

From the stockyard, a standard gauge railway runs north past the bending-slabs and furnace shed, and west by the blacksmith shop and plate shed, while sidings run off southward between each pair of building berths. On this track, two locomotive cranes and a number of gasoline jitneys carry all the material that goes into the making of the ships. The steel, which comes from Pittsburgh or Chicago, is loaded, still in its car, on a barge at the Vancouver side of the Inlet and is towed across to the barge-slip. There it is unloaded by one of the locomotive cranes and finds its way to its proper place in the stock-yard. From the stock piles, the plates go at once to the plate shed if they have only to be marked and punched, or, if they require to be set first, they go to the plate furnace and slabs. A continuous monorail system runs completely round the plate shed. It is equipped with electric travelling hoists and assists greatly in the rapid and efficient handling of the material. The shed contains six standard punching machines so equipped that the one man can handle the great steel plates as they pass through the machines, and can do the work that formerly required six.

The angle-bars are all punched in the stock-yard, returning to the machine there, if it is necessary to bend them first on the slabs or to do some forging on them in the angle-bar smithy. Bars and plates, once they are set and punched, are carried on one of the jitneys on the railway track to the required spot between the building berths.

Used Derricks Instead of Gantry

For their first ships, the Wallaces used a great steel gantry frame with a travelling crane on top. This has been discarded and the gantry is in course of demolition. Instead, between each pair of berths, two towers have been erected, each carrying a stiff-legged derrick at each end, fitted with a boom 80 feet long. The towers are so high that the boom can swing across the deck of a completed ship. This system has been found much more flexible than the old one. The old gantry crane could be used on only one ship at a time, and when there was no work for it to do on its own particular ship it stood idle. Under the new system, it is possible to concentrate all the derricks on a single ship if necessary, or they can serve two or three ships, as desired. The booms are long enough to handle material on either side of the ship on which they are engaged. The derricks, like nearly all the machinery in the yards, are operated by electricity.

The mould loft has been mentioned. This is an important section of the drafting department of any shipyard. In the Wallace plant, it is located above the plate shed and is 185 feet by 80 feet in size. Here, on the blackened floor, the ship is drawn to size from the blueprints, and the wooden templates, which are to serve as moulds or models for the various steel parts, are constructed of quarter-inch spruce. It might almost be said that the ship is built on paper first, then in wood, and finally in steel.

Make Everything But Boilers

A unique feature about the Wallace



THE THIRD WALLACE SHIP, "WAR STORM"



UNDER THE STERN OF THE "WAR DOG"

Shipyards is that they are the only shipbuilders in British Columbia who make their own machinery. A Wallace-built ship is Wallace-built from stem to stern, almost, and inside and out. With the exception of the boilers and the deck and engine-room auxiliaries, practically everything is built in the yards. Even the interior finishings and the oak and fir cabinet work in the cabins and messrooms are turned out in the firm's cabinet shop. The boilers are built to Wallace designs by the Vulcan Iron Works of Vancouver, and very little of the other machinery that comes from outside is not built in British Columbia.

The engines placed in the "War Dog" and her sister ships were the first of any considerable size to be built in British Columbia. To construct them was a large undertaking and necessitated the establishment of a foundry on Industrial Island, in Vancouver. This foundry, handling both iron and brass, is able to produce all the castings needed for the Wallace engines and for the repair work done in the yards, and attends to some custom work as well. It has produced several large castings for export, and is making a specialty of manganese-bronze propellers. All the patterns are made in the shipyard pattern shop, and the machine work on the castings is done by the shipyard lathes and planes on the North Shore. Each engine is built, complete, in the machine shop and is then taken down and installed on board ship.

Besides the engines for the Wallace ships, the machine shop has handled three sets of triple expansion engines for the Imperial Munitions Board. These are all of about 1,000 indicated horse-power and have cylinders of 20-in., 33-in. and 54-in. with a 40-in. stroke. The original contract was for the construction of the three engines only, but a latter contract called for the installation and completion of two of these sets in the wooden steamships "War Cayuse" and "War Atlin." The third set has been delivered at Victoria and is being installed at the Ogden Point plant of the Imperial Munitions Board.

Large Repair Plant Also

Besides building ships, the Wallace firm conducts the most extensive ship repair business on the mainland of British Columbia, and this side of the business gives promise of great growth as each year sees greater tonnage coming to the port of Vancouver. The repair plant is run in connection with the shipbuilding plant. Indeed, it was an important business before the shipbuilding was thought of. There are two marine railways in the yards, capable of handling ships up to 2,000 tons, and it is very seldom that one finds them idle. Both coastwise and off-shore vessels are handled.

A notable piece of repair work was completed during the autumn. The Aeronautical Supplies Department of the Imperial Munitions Board had a couple of steel tugs, the "Point Grey" and the "Point Ellice," which had been taken over from the Public Works Department. These tugs had been built for harbor work and had but a limited fuel capacity. The Munitions Board people wished to use them for towing rafts of spruce logs to sawmills on and about the Queen Charlotte Islands. Harbors with bunkering facilities are few and far between in these northern waters, and it was necessary that the tugs should be able to carry a goodly supply of coal, if they were to be of any value. Wallaces solved the problem. They ran the tugs up on their marine railways, cut them in two in the centre and inserted a section 14½ feet long in the "Point Ellice" and a section 17 feet 9 inches long in the "Point Grey."

As stated already, Mr. Wallace is the head and moving spirit of the enterprise, but he has able assistance in Mr. H. J. Turner, secretary of the company; Mr James Cant, general superintendent, and Mr. G. Browning, chief engineer.

THE FUTURE OF BRITISH SHIPPING

By M. M.

The future of British shipping after the war is somewhat obscure. There will, no doubt, be an immense amount of work to be done in re-provisioning Europe and in providing industry with the raw materials, of which it is so woefully short. Moreover, though a vast amount of tonnage now used as auxiliary to the Naval forces, will be freed soon after peace is attained, there will be immense demands on the shipping of the work in repatriating the armies of Britain and of the United States. The building programmes now under execution will not be sufficient to cope with all demands for transport, and accordingly there has recently been a great spurt in shipping companies' shares. A table has recently been published showing the movement of the securities of four important concerns.

Company	7th Sept., 1918	Lowest Price 1918	1914
Cunard Line	5⅝	3⅞	1⅜
Furness, Withy & Co..	4 3-16	2⅞	1¼
P. & O. stock (deferred)	450	327	260
Royal Mail S. P. Co...	155	120	78

BRITISH, U.S. AND CANADIAN PAY FOR ENGINEERS

Standard Pay for Engineer Officer of England, Etc.

AT a meeting of the Engineer Officers' Panel of the National Maritime Board held at the Ministry of Shipping, on the 19th March, 1918, the decisions of the Shipping Controller with regard to the monthly pay of engineer officers on cargo liners and general trading vessels, and the decision with regard to overtime at sea, were accepted.

The scale of monthly pay is as follows for vessels of a gross tonnage over 1,000 and not exceeding 9,000 tons:

Gross Tonnage	First Engineer Certificated						First Engineer Uncertificated				Second Engineer Certificated				Second Engineer Uncertificated					Third Engineer Certificated			Third Engineer Uncertificated			
	Begin at	After 1 year.	After 2 years	After 3 years.	After 5 years	After 6 years.	Begin at	After 1 year.	After 2 years.	After 3 years.	Begin at	After 1 year.	After 2 years.	After 3 years.	Begin at	After 1 year.	After 2 years.	After 3 years.	Begin at	After 1 year.	After 2 years.	After 3 years.	Begin at	After 1 year.	After 2 years.	After 3 years.
	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£	£
1001 and over	7¼	7⅜	7½	7¾	8		6¼	6⅜	6½	6¾	6½	6⅝	6¾	7	5¾	5⅞	6	6¼	6	6¼	6¼	6½	5¼	5⅜	5½	5¾
501 to 1000	7	7⅛	7¼	7½	7¾		6	6⅛	6¼	6½	6¼	6⅜	6½	6¾	5½	5⅝	5¾	6	5¾	5⅞	6	6¼	5	5⅛	5¼	5½
201 to 500	6¼	6⅜	6½	6¾	7		5¾	5⅞	6	6¼	5½	5⅝	5¾	6	5¼	5⅜	5½	5¾					4¾	4⅞	5	5¼

An officer's pay under the new scale will be determined as regards service by the period he has held his present post in the same employment as at the 19th March, 1918. An officer will be entitled to back pay at the same rate for any period of service on articles (or continuous employment with the same owners, irrespective of articles) from the 6th October, 1917, or from the date of commencing pay, if subsequent thereto.

Increments will date from the anniversary of the date of taking up present post in the same employment.

It is to be understood that the cases of oil tank steamers, motor vessels, salvage and cable steamers and other exceptional matters, are not covered by this decision and have yet to be considered by the board.

The rates for boiler-makers, refrigerating and electrical engineers are also to be considered by the board.

The decision of the Shipping Controller with regard to watch keeping at sea, which has been accepted by the board, is that all work done by engineers over and above watch keeping at sea, shall be entered in the official log with a view to ascertaining exactly to what extent such work takes place, and a clause is to be inserted in the articles of every ship so as to give effect to this.

The board has decided that this clause should be inserted in all foreign-going articles opened on and after Wednesday, 27th March, 1918, and in home trade coasting articles at the earliest practicable date.

The board agreed in principle to the payment of overtime in home ports at definite rate, but the details of this arrangement have yet to be worked out.

The question of the overtime in foreign ports will be considered at the meeting of the board.

Standard Rates of Pay for Engineer Officers

On the 21st March the Shipping Controller announced the standard rates of pay for engineer officers on cargo liners and general trading vessels. At a meeting of the Engineer Officers' Panel of the National Maritime Board, held on the 26th inst., under the presidency of Sir Leo Chiozza Money, M.P., the following scale of engineer officers, serving on general trading vessels at weekly rates of pay and finding their own food, was agreed to by the board and has since been confirmed by the Shipping Controller:

Their food is found by the owners, the appropriate rate should be obtained by deducting from the above rates 25s. weekly or pro rata for part of a week.

These rates do not apply to the cases of oil tank steamers, motor vessels, salvage and cable steamers, railway steamers and other exceptional matters which have yet to be considered by the board.

An officer's pay under the new scale will be determined as regards service by the period he has held his present post in the same employment as at the 26th March, 1918.

An officer will be entitled to back pay at the same rate for any period of service on articles or continuous employment with the same owners irrespective of articles, from the 16th October, 1917, or from the date of commencing pay if subsequent thereto.

Increments will date from the anniversary of the date of taking up present post in the same employment.

An agreement has also been reached regarding the payment for overtime work by engineers in home and foreign ports.

Overtime in Home and Foreign Ports

The following clause will be inserted in the articles of all vessels opened on and after the 22nd April, 1918:

In port, when watches are suspended, the hours of work for engineer officers (except chief engineer) shall be as follows:

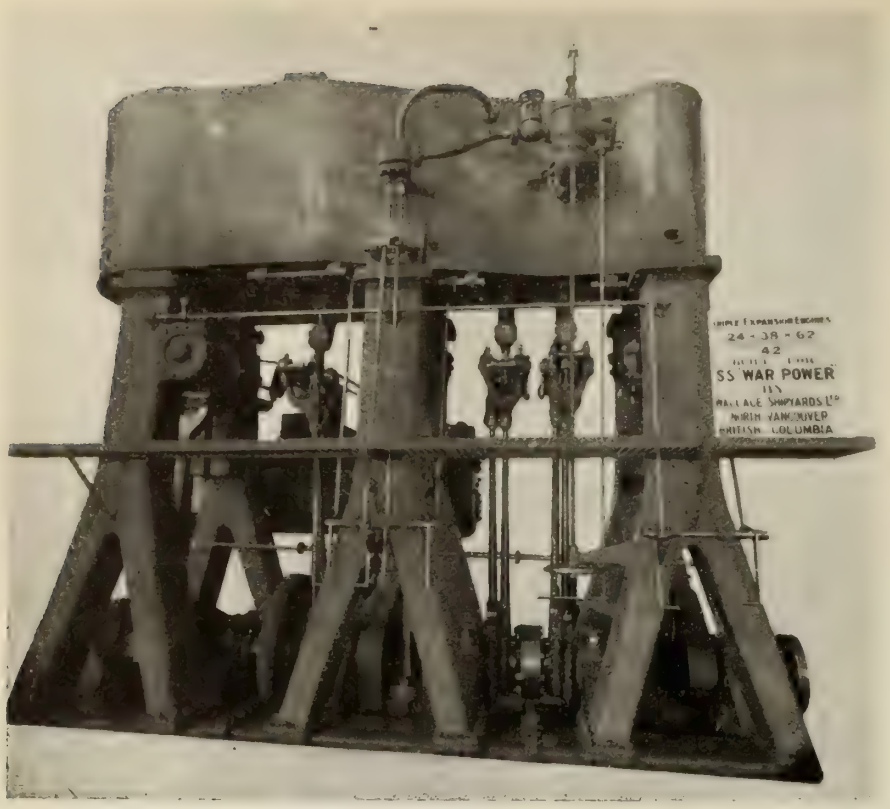
Monday to Friday, 7 a.m. to 5 a.m.

Saturday, from 7 a.m. to 1 p.m.

Time worked outside these hours and on Sunday, Christmas Day and New Year's Day to be paid for at the rate of 3s. 6d. per hour, except in the following cases:

Day of arrival. No overtime payable until the expiring of two hours after

Gross Tonnage	Chief Engineer						Second Engineer With Certificate of Superior Rating.				Second Engineer With Certificate of Rating.			Third Engineer With Certificate of Superior Rating.			Third Engineer Uncertificated.		4th Eng. 5th or Jr. With or without Certific.	4th Eng. 5th or Jr. With or without Certific
	Begin at.	After 1 year.	After 2 years.	After 3 years.	After 5 years.	After 6 years.	Begin at.	After 1 year.	After 2 years.	After 3 years.	Begin at.	After 1 year.	After 2 years.	After 3 years.	Begin at.	After 1 year.	Begin at.	After 1 year.		
	£	£	£	£	£	Further increase (if any) at owner's discretion.	£	£	£	£	£	£	£	£	£	£	£	£	£	£
1000 to 3000	25	27	29	31	33		22	22½	23	24	21	21½	22	23	19½	20	19	19½	17	16
3001 to 5000	26	28	30	32	34		23	23½	24	25	22	22½	23	24	20	20½	19½	20		
5001 to 7000	27	29	31	33	35		24	24½	25	26	23	23½	24	25	20½	21	19½	20		
7001 to 9000	28	30	32	34	36		25	25½	26	27	24	24½	25	26	21	21½	20	20½		



ENGINES OF WAR POWER

master has finished with engines, or ten hours (inclusive of meal times) previously worked, whichever be the longer period.

Day of departure. No overtime payable within twelve hours of departure for the ordinary duties of raising steam and testing main engines and necessary auxiliaries.

Engineers in charge. No overtime payable where engineers are appointed as engineers in charge for night duty and are given equivalent time off duty.

Foreign ports. No overtime payable at foreign ports when vessel does not load or discharge cargo and remain for more than twenty-four hours.

Lost time. No overtime payable until full day has been worked.

Note.—The question of overtime at sea will be reviewed in six months' time. In addition to the usual lost entries by the chief engineer, instructions have been issued that all work done by engineer officers over and above normal watch keeping at sea shall be entered in the official log, the entry to show the precise nature of the work, the date and the exact time taken.

Ship owners have been requested to instruct masters of their ships to this effect.

Canadian Scale

Conditions of Employment

All engineers shall be provided with first-class transportation, board and other legitimate expenses during their employment away from home.

All references to tonnage to be construed as gross tons.

In reference to all monthly conditions, 30 days to constitute a month.

All ratings in all classes to include board and accommodation excepting passenger ferry steamers.

Overtime at the rate of 75 cents an hour for all time over twelve hours shall be paid engineers on boats carrying only one engineer.

Any special conditions of employment not covered by the provisions of this wage scale to be submitted to the Great Lakes Executive Committee through the Business Manager for adjustment.

Passenger Steamers

Class No. 1

All passenger steamers of 3,000 tons or over.

Chief engineer, $2,400 per season.
Second engineer, $150 per month.

Class No. 2A

All passenger steamers of 1,250 tons and under 3,000 tons, running six months or over.

Chief engineer, $2,100 per season.
Second engineer, $150 per month.

Class No. 2B

All passenger steamers of 1,250 tons and under 3,000 tons, running less than six months.

Chief engineer, $1,900 per season.
Second engineer, $150 per month.

Class No. 3

All lake passenger steamers under 1,250 tons and all passenger steamers confined to river service requiring second class engineer.

Chief engineer, $1,650 per season.
Second engineer, $105 per month.

Class No. 4

All passenger steamers from 45 N.H.P. to 25 N.H.P.

Chief engineer, $150 per month.
Second engineer, $110 per month.

Class No. 5

All passenger steamers under 25 N.H.P.

Chief engineer, $125 per month.

Freight Steamers

Class No. 1

All freight steamers of 5,000 tons or over.

Chief engineer, $2,400 per season.
Second engineer, $180 per month.

Class No. 2

All freight steamers of 3,000 tons and under 5,000 tons.

(Continued on page 66)



PLATE SHED IN WALLACE YARDS.

Pacific Construction Company Yard at Coquitlam

Resurrection of an Old Plant—Though Twenty-five Miles From Salt Water, is Independent of the Tide—Only Fresh-water Yard on the Pacific Coast—Covers Fourteen Acres

NOT large, sequestered perhaps, and somewhat farther removed from Pacific Coast commercial centres than other shipbuilding yards in British Columbia, the plant of the Pacific Construction Company, at the confluence of the Pitt and Fraser rivers, is, nevertheless, a busy hive of industry, and has proven a very real boon to the much-boomed city of Coquitlam, robbed, as it was, by war and financial depression of no small portion of its prospects and population. The yards are situated on the west bank of the Pitt not far from the point where that clear stream empties itself into the turbid Fraser.

An Old Plant Rebuilt

Years before the war, Coquitlam had a shipyard which turned out one ship, the "City of Coquitlam" and then went out of business. In the spring of 1916, this yard, out of repair, and practically dismantled, was taken over by the Pacific Construction Company which had secured contracts for building wooden steamships for the Imperial Munitions Board. The plant occupies an area of almost 14 acres one a gentle slope toward the river edge, where 1,600 feet of deep water affords sufficient fairway to ensure safe launchings. A broad basin is formed by the confluence of the two streams and the depth of water is such that a ship can be launched without waiting for a favorable tide. Of no other yard on the Pacific Coast can this be said.

A Trick Water Location

Another advantage which the Coquitlam plant may possess in case wooden shipbuilding comes a cropper lies in its distance from the sea—25 miles. It may be used as a docking basin for ships requiring cleaning and repairs and its fresh water is expected to offer a temptation to barnacle-encrusted vessels.

The first two ships constructed on the Pitt river were the War Tyee and the War Sumas, 2,800-ton standard vessels built to the order and design of the Imperial Munitions Board and under the supervision of Lloyd's agent, Mr. W. Barnett. The hulls were built at Coquitlam but the outfitting was done at the Ogden Point yards of the Munitions Board. The easing of the war situation gave the company an opportunity to look afield for orders and the next ship to be laid down was the Antonius, a vessel of 2,800 tons for a Greek mercantile company. This ship was launched early in December and is now being fitted out at the fitting-out berth which the company has established at Industrial Island, Vancouver. Another vessel for the Greek company is now on the stocks and almost ready for launching. Two ships of 1,500 tons each are under construction for the French Government and the keel has been laid for a 3,000-ton vessel for a Belgian syndicate.

As the ships are built of wood, the necessary timber and lumber is drawn from the sawmills along the Fraser, or nearby Pacific Coast, some of the timbers coming even from Vancouver Island. All this reaches the yards by water. Materials which come by rail are transported from the C.P.R. at Port Coquitlam, a distance of two miles, by wagon or motor truck. The roads are fairly good and as the distance is not great, the absence of a spur track is not very keenly felt.

The Plant

When the Pacific Construction Company took over the old yards, it was found necessary to reorganize them and to build newer and larger ways. Machine shops had to be erected as well as a smithy and quarters for the workmen. The yard boasts besides this a large one-frame sawmill with a 48-inch bevelling bandsaw and a general wood-working mill with two large bandsaws, a tree-nail machine, bevelling planers, a circular saw, a lathe and a planer. In the machine shop are a lathe-drill press, grinder and bolt-cutting and threading machines. The blacksmith shop has four fires and a bolt-heading machine. Travelling cranes operate between each pair of hulls and handle materials to either side. Adequate fire protection is afforded by hydrants with a pressure of 135 pounds put in by the city of Port Coquitlam which would be loth indeed to lose its one big industry. Another feature of the plant is its up-to-date first aid department and the insistence laid on safety first principles. Accidents in an industry of this nature are unavoidable, but at the Coquitlam yards they are rendered surprisingly few through careful instruction of the men in the avoidance of danger zones. All the machinery in the yards is operated by electricity.

As already stated, the establishment of the shipyards proved a real boon to Port Coquitlam, not so much because it brought new population as because it afforded employment for the people already settled in the town. The number of employees varies, of course, with the stage of construction reached on the various vessels, but it seldom drops below 400 and quite frequently rises to 525. The payroll oscillates in sympathy from $50,000 to $60,000 monthly.

The Principal Men

Mr. H. P. Simpson is the business manager and operating head of the company, and Mr. W. A. Lashe is the plant superintendent. The practical work of construction is in the hands of Mr. A. Bennie, who brings to his work the knowledge and skill imbibed during many years on the Clyde. J. R. McKenzie, once mayor of Port Coquitlam, is a foreman of construction.

SHIPPING DEVELOPMENTS AT BELFAST

Definite and most interesting information as to the shipbuilding developments, now under way at Belfast, was communicated by the chairman of the Belfast Harbor Board at one of its recent meetings. During the past year about 150 acres of the harbor estate on both sides of the river Lagan have been let to the local shipbuilding firms, representing almost a doubling of the area presently devoted to shipbuilding and marine engineering. About 124 acres have been let to Messrs. Harland and Wolff, Ltd., and 24 acres to Messrs. Workman, Clark & Co., Ltd. On an area of 85 acres of recently reclaimed land on the east side of the Musgrave Channel, Messrs. Harland and Wolff's contractors are now laying out a new shipyard, erecting workshops, and the necessary overhead equipment. The water frontage is over 900 ft., and there is accommodation for six building berths on which it will be possible to construct vessels up to and over 1,000 ft. On another area of 40 acres, situated between Musgrave Channel and Queen's Road, the same firm intend laying down premises for engineering purposes. Messrs. Workman, Clark & Co., have acquired 24 acres for extensions to their North Shipbuilding Yard supplementary to their extension carried out about five years ago, in which the firm then laid down two building berths, and to utilize the rear portion of the new ground in various ways necessary to the carrying on of a shipbuilding business. The firm has at present twelve building berths, five of which are in the south yard on the Co. Down side, which is undergoing reorganization. Side by side with this private enterprise, the Harbor Commissioners are embarking on a most extensive scheme of harbor works, including wharves and jetty quays, deepening of channels, etc., the carrying out of which will be spread over a considerable number of years. Parliamentary powers, involving an expenditure of 2½ million pounds on these works, which also include the construction of a new graving dock, 975 ft. long, and an entrance width of 111 ft., have been obtained during the present session.

New Westminster Construction & Engineering Co.

Yard at Poplar Island Was Formerly a Mud Bank—A Graveyard For Worn-out Vessels—First Vessel Launched Nine Months After Starting Work on the Site—Four Ships Completed

THE story of the rise of the shipbuilding industry at New Westminster is the story of the transformation of a ships' graveyard into a thriving industrial centre. When the Imperial Munitions Board undertook to stimulate the construction of wooden vessels on the Pacific in 1917, Poplar Island, a twelve-acre mudbank in the Fraser, close by the Royal City, had an evil name. For years it had been occupied only by the bleaching bones of river derelicts and cripples. To-day, the name is a name to conjure with. It raises visions of prosperity, accomplishment and a goodly payroll, for it is the site of the shipbuilding plant of the New Westminster Construction and Engineering Company. This concern, formed by New Westminster and Victoria business men, has made steady progress since its inception and is now engaged on the construction of five ships for the French Government and three for Belgian interests. During the height of the company's activity, six months ago, or so, the monthly payroll was in the neighborhood of $80,000. To-day, it has fallen to $60,000, but the industry is still the premier one in New Westminster, and gives steady and remunerative employment to between 200 and 300 residents.

Preparing The Yard

The clearing of the site for the yard began in June, 1917, and the keel of the first vessel, the War Comox, was laid in August. Six months later, the War Comox was launched, and by that time, three other ships were under way. All four vessels were constructed according to specifications of the Imperial Munitions Board and under the direct supervision of the board's officials and Lloyd's representatives.

The difficulties of construction were considerable, at first. The only means of approach to the island, when the company heads first looked it over, was by water. A narrow channel of the Fraser separated it from Lulu Island, which is connected with the city of New Westminster by a railway and vehicular drawbridge. A few weeks after the initial inspection a bridge was thrown across this narrow channel, and employees are now able to ride to within a few hundred yards of their work. All material not brought to the yards by water is routed across this bridge via the B. C. Electric Railway, which has a spur line to the island.

In wooden shipbuilding, an essential is proximity to sawmills, and in this, the Poplar Island plant is particularly fortunate, as New Westminster boasts three large mills, the Small and Bucklin mill within a stone's throw of the yards, the Brunette mill farther up the river and the huge plant of the Canadian Western Lumber Company, scarcely three miles away. This latter is reputed to be the largest saw-milling plant in the world. The yard is equipped with modern woodworking appliances and electric cranes and boasts facilities for not only constructing hulls but for installing their engines as well.

Electric Power

Power for the yards is generated at the Stave Lake plant of the Western Power Company of Canada. Some of the specially installed machinery includes a Stetson planer that will smooth the four sides of a plank simultaneously, a beveller capable of developing great speed, three heavy bandsaws and a full equipment of travelling derricks. These derricks are unique on the coast inasmuch as they are separately operated by compressed air. An assembly plant for the



NEW WESTMINSTER CO.'S YARD

installation of machinery completes the equipment.

Four ships have been completed at the Poplar Island yards, the War Comox, the War Edensaw, the War Kitimaat and the War Ewen. These are all ships of 2,800 tons deadweight carrying capacity with dimensions as follows: Length, B. P. 250 feet, moulded beam 42½ feet, moulded depth 25 feet, draft over keel 21 feet. The hull of each vessel is divided by four bulkheads in addition to the deep tank bulkheads, and all are fitted with topgallant forecastle and combined poop and bridge and are equipped with cargo gear, four hatches with five steam winches, and steam windlasses.

Before the last of the four ships mentioned was off the ways, contracts had been signed for five vessels of similar design but of 1,500 tons capacity for the French Government, and, later, a contract for three more of 3,500 tons capacity was secured from a Belgian syndicate. These are now under way, and John Hastie and H. M. Fullerton, active heads of the company, are at present in New York endeavoring to land other contracts. On their success depends the future of the wooden shipbuilding industry on Poplar Island.

The Future for Wood

Experts on tonnage problems, now that the war is over, do not agree as to what the future holds in store for wooden ships. They admit that steel vessels are preferable, but are divided when it comes to a question of the available supplies of steel. The heads of the New Westminster Construction and Engineering Company believe that the present world shortage of steel cannot be overcome by after-war stimulation of production for several years. Meanwhile, they say, the demand for tonnage will be so great that wood ships simply must be built to carry on until steel production is once more able to meet the demand. Should events prove, however, that sufficient steel is available at any time in the near future, the concession is made without reservation that the end of wooden shipbuilding in British Columbia is in sight. When such time comes, the company, which has a long lease of the island, is prepared to remodel its yard and take up a new industry which will give employment to a substantial number of men.

The Executive Officers

Mr. John Hastie, president of the company, has been actively associated with ships and ship construction on the coast for the past twenty years. H. M. Fullerton, general manager and secretary-treasurer, is a Victoria man, with a proven capacity for organization and attention to detail. H. Waldo Bucklin, head of the Small and Bucklin Lumber Company of New Westminster, is one of the directors, the balance being Victoria and Royal City capitalists. C. C. Hastie is assistant to Mr. Fullerton and supervises directly much of the detail of construction.

LLOYD'S REGISTER SHIPBUILDING RETURNS

For Quarter Ended December 31, 1918

In consequence of the War it has not been possible to compile complete information regarding the Shipbuilding Industry throughout the world. The present returns comprise all Merchant vessels in course of construction in the United Kingdom, the British Dominions, and Allied and Neutral Countries. Warships and vessels built to the order of the Admiralty for other than mercantile purposes are excluded.

MERCHANT VESSELS UNDER CONSTRUCTION

The returns compiled by Lloyd's Register of Shipping which only takes into account vessels of 100 tons and upwards the construction of which has actually begun, show that there were 424 merchant vessels of 1,979,952 tons gross under construction in the United Kingdom at the close of the quarter ending December 31st, 1918. The particulars of the vessels in question are as follows, similar details being given for the last quarter for the purpose of comparison:

Description.	Dec. 31, 1918. No.	Dec. 31, 1918. Gr. Tons	Sept. 30, 1918. No.	Sept. 30, 1918. Gr. Tons
Steam—				
Steel	414	1,975,962	373	1,742,083
Iron	...	...	...	...
Wood and Comp.	2	1,240	...	...
Total	416	1,977,202	373	1,742,083
Sail—				
Steel	8	2,750	10	4,850
Iron	...	...	...	...
Wood and Comp.	...	...	...	...
Total	8	2,750	10	4,850
Total Steam and Sail	424	1,979,952	383	1,746,933

During Quar. ended Dec. 31, 1918	Steam No.	Steam Gr. Tons	Sail No.	Sail Gr. Tons
Vessels commenced	114	550,351	3	1,350
Vessels launched	83	397,186	...	...

Where Building	Steam No.	Steam Gr. Tons	Sail No.	Sail Gr. Tons
United Kingdom.	416	1,977,202	8	2,750
Other Countries.	1,602	4,843,060	163	98,977
Total for World.	2,018	6,820,262	171	101,727

Ferro-concrete vessels are not included as practically all such vessels now under construction are for Admiralty account. The tonnage now under construction in the United Kingdom is about 233,000 tons more than that which was in hand at the end of the last quarter, and about 113,000 tons more than the tonnage building 12 months ago. Of the merchant vessels being built in the United Kingdom at the end of December, 335 of 1,593,283 tons are under the inspection of the Surveyors of Lloyd's Register with a view to classification by this society.

The following details concerning the shipbuilding work of the United Kingdom during the past three months may be added:

District	Descrip.	Dec. 31, '18 No.	Dec. 31, '18 Gross Ton'ge	Sep. 30, '18 No.	Sep. 30, '18 Gross Ton'ge
Barrow, Maryport and Workington	Steam	4	25,880	3	6,380
	Sail	...	...	...	...
	Total	4	25,880	3	6,380
Belfast	Steam	39	312,775	29	232,700
	Sail	...	...	...	...
	Total	39	312,775	29	232,700
Glasgow	Steam	72	342,020	73	329,028
	Sail	6	2,430	5	1,980
	Total	78	344,450	78	331,008
Greenock	Steam	51	268,730	50	271,080
	Sail	...	...	...	...
	Total	51	268,730	50	271,080
Hartlepool	Steam	19	77,200	20	82,000
	Sail	...	...	...	...
	Total	19	77,200	20	82,000
Hull	Steam	6	20,611	6	28,711
	Sail	...	...	...	...
	Total	6	20,611	6	28,711
Liverpool	Steam	13	34,360	9	31,220
	Sail	...	...	1	1,250
	Total	13	34,360	10	32,470
Middlesbro' and Stockton and Whitby	Steam	3	146,820	26	130,100
	Sail	...	...	...	...
	Total	31	146,820	26	130,100
Newcastle	Steam	71	378,015	64	330,755
	Sail	...	...	...	...
	Total	71	378,015	64	330,755
Sunderland	Steam	54	241,175	49	218,245
	Sail	...	...	...	...
	Total	54	241,175	49	218,245

The following tables give the total figures for vessels now under construction in some of the principal shipbuilding districts of the country as compared with those for the last quarter. Each district of course included places in the neighborhood of the port after which it is named:

The following table shows the vessels under construction in the United Kingdom classified according to gross tonnage:—

Gross Tonnage	Number Steam	Number Sail
*100 and under 500 tons	20	8
500 " 1,000 tons	17	...
1,000 " 2,000 tons	34	...
2,000 " 3,000 tons	43	...
3,000 " 4,000 tons	48	...
4,000 " 5,000 tons	12	...
5,000 " 6,000 tons	149	...
6,000 " 8,000 tons	18	...
8,000 " 10,000 tons	29	...
10,000 " 12,000 tons	4	...
12,000 " 15,000 tons	6	...
15,000 " 20,000 tons	2	...
20,000 " 25,000 tons	4	...
25,000 " 30,000 tons	...	...
30,000 " 40,000 tons	...	...
40,000 tons and above	...	...
Total	416	8

*Vessels of less than 100 tons are not included in Lloyd's Register Shipbuilding Returns

MERCHANT VESSELS UNDER CONSTRUCTION

(Allied and Neutral Countries

Countries	Steamers and Motor Vessels. Steel. No.	Steel. Gross Tons.	Wood. No.	Wood. Gross Tons.	Sailing Vessels. Steel. No.	Steel. Gross Tons.	Wood. No.	Wood. Gross Tons.	Total. No.	Total. Gross Tons.
British Dominions (Great Lakes	31	62,990	1	2,400	..	....	...	.....	)	
Canada. (Coast	21	76,666	48	61,139	..	....	47	22,069	) 195	278,711
Other Dominions	9	40,402	10	4,858	..	....	28	8,187	)	
China	6	8 968	1	850	...	....	..	.....	7	9,818
Denmark	45	70,258	5	1,770	1	115	..	.....	51	72,143
France	12	51,690	..	.....	..	...	..	.....	12	51,690
Holland	113	212,512	..	.....	..	...	..	.....	113	212,512
Italy	20	112,300	26	16,500	..	...	10	4,210	56	133,010
Japan	89	257,777	27	20,363	..	...	..	.....	116	278,140
Norway	54	62,157	17	5,581	..	...	..	.....	71	67,738
Portugal	..	.....	2	700	..	...	34	14,420	36	15,120
Spain	30	76,335	1	246	1	250	3	766	35	77,597
Sweden	48	89,368	28	10,271	..	...	..	.....	76	99,639
United States (Atlantic Coast	286	1,494,496	98	205,160	2	4,600	22	25,450	)	
United States (Gulf Ports	10	76,810	107	272,610	1	4,500	11	10,460	) 997	3,645,919
United States (Pacific Coast	120	706,350	218	551,140	..	...	3	3,950	)	
United States (Great Lakes	119	290.393	..	.....	..	...	..	.....	)	
Total	1013*	3,689,472	589	1,153,588	5	9,465	158	89,512	1,765	4,942,037

*Including 14 ferro-concrete vessels of 26,370 tons.

Of the steel steamers building abroad (Allied and Neutral countries) at the end of December, 527, of 2,236,617 tons—or 60.62 per cent. of the tonnage—are intended for classification with Lloyd's Register.

BRITISH, U. S. AND CANADIAN PAY FOR ENGINEERS

Continued from page 61

Chief engineer, $2,100 per season.
Second engineer, $150 per month.

Class No. 3

All water bottom freight steamers under 3,000 tons, requiring second class engineer.

Chief engineer, $1,900 per season.
Second engineer, $130 per month.

Class No. 4

All freight steamers not included in Classes Nos. 1, 2 and 3 and requiring second class engineer.

Chief engineer, $1,800 per season.
Second engineer, $120 per month.

Class No. 5

All other freight steamers not otherwise classified.

Chief engineer, $155 per month.
Second engineer, $110 per month.

Tug Steamers

Class No. 1

All tug steamers requiring second class engineer.

Chief engineer, $165 per month.
Second engineer, $130 per month.

Class No. 2

All tug steamers from 75 N.H.P. to 50 N.H.P.

Chief engineer, $150 per month.
Second engineer, $125 per month.

Class No. 3

All tug steamers from 50 N.H.P. to 25 N.H.P. and all H.P. tugs over 15 N.H.P.

Chief engineer, $145 per month.
Second engineer, $115 per month.

Class No. 4

All tug steamers under 25 N.H.P. and not embraced in Class No. 2.

Chief engineer, $130 per month.
Second engineer, $105 per month.

Class No. 5

All tugs operating exclusively in Welland Canal (dredge tugs excepted).

Engineer, $140 per month.

Overtime clause not to apply in this class.

In addition to the foregoing, all engineers of tug steamers operating from the harbors of Fort William and Port Arthur shall be paid 10 per cent. over the rates in the above four classes.

Ferry Steamers

All passenger ferry steamers operating from Sault Ste. Marie, Ont., and requiring second class engineers.

Chief engineer, $170 per month.
Second engineer, $160 per month.

For season of not less than ten months.

All other passenger ferry steamers requiring second class engineer.

Chief engineer, $160 per month.

Minimum for season not to be less than $900.

All passenger ferry steamers requiring third class engineer.

Chief engineer, $135 per month.

New Wage Scale U. S. Vessels

A special committee consisting of Franklin D. Mooney, R. P. Bass, and W. L. Brown have decided on the following scale of wages for licensed officers of steam vessels:

AIR-COMPRESSOR TROUBLES

Some time ago a small belt-driven vertical air-compressor was installed in a certain boiler-room where there was considerable dust, due to handling coal and ashes. It was necessary to extend the 1½-in. inlet pipe outside of the building. As the unloader was of a sensitive construction, and as the least bit of dirt would make the pistons stick, causing poor regulation, considerable power was wasted because of the safety valve on the receiver releasing continually.

It was desired to connect the pipe as direct to the compressor and with as few fittings as possible, which located the end of the suction pipe between the eaves of three roofs. To keep it free from water and other obstructions, a hood was made from 6-in. galvanized sheet metal pipe with a 2-in. galvanized pipe nipple. These parts were all taken from used material found about the factory. This arrangement has worked satisfactorily for about a year, and it has never been necessary to clean out to unload, nor has there been any trouble from poor regulation.—M. E.

New York—The Cunard Steamship Company has purchased from the British Government six cargo steamships of an aggregate tonnage of 29,734, it was announced here to-night. The vessels, standard cargo carriers built by the British Government for use during the war, will soon be placed in active sevice by the company. The purchase price was not made public. The vessels, which were of the "war series," have been renamed.



THE MOLD LOFT, WALLACE SHIPYARDS.

Structural Steel Company Become Shipbuilders

Coughlan Iron Works Before the War Supplied Steel For Large Vancouver Buildings—Became Shell Plant—Then Steel Shipbuilders—The 8,800 Ton "Alaska"—Destructive Fire Causes Damage—The Yard and Berths

THERE are two magics about a ship, the magic of the building of it, and the magic of the sailing of it; the magic of the steel and the magic of the sea. Which is the more powerful, it is difficult to say. The sea lures by its romance and mystery, by the unknown and the unknowable, by its very terribleness. In steel is the same appeal that gave zest to the labors of Hercules. The rugged, stubborn metal offers to the ambitious an opponent worthy of his brawn and brain. It affords an opportunity to overcome and to taste the satisfaction and content to which the hard-won victory gives birth.

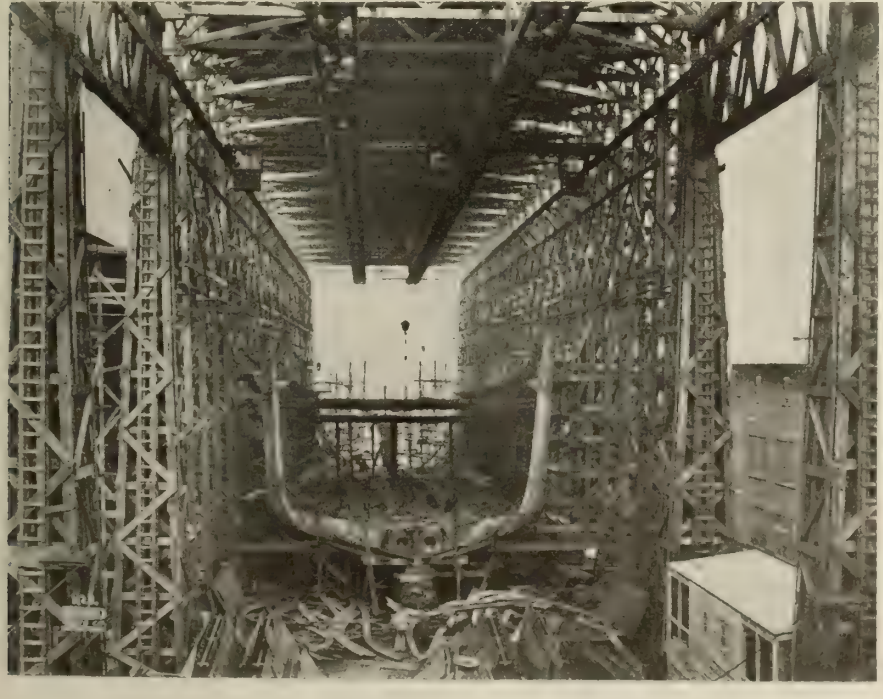
A Quick Growth

Vancouver's most considerable industry has to do with steel and with ships; with brawn, too, and with brain. Vancouver City is almost a third of a century old, but its chief industry, the shipyards of John Coughlan & Sons, is a child of the war and has been in existence, as a going concern, less than two years. It started with less than 150 men. Now, it gives employment to 2,750 workers, has a weekly payroll of $75,000, and boasts a plant covering some 24 acres. In the year 1918 it launched steel ships of a total tonnage of 52,800.



THE PLATE SHED AT THE COUGHLAN YARDS, VANCOUVER. THIS SHED CONTAINS A 45-TON PLATE ROLLER, FIFTEEN PUNCHES AND SHEARS, THREE SPACING TUBES, ETC.

Some years ago, when real estate was a marketable commodity and the most remarkable thing about Vancouver was its building boom, John Coughlan had a large iron works and supplied most of the structural steel for the larger buildings in the city. With the collapse of the boom, however, and the coming of the war, the firm's business showed signs of vanishing. The making of shells helped tide over a threatening period, and by the time that disappeared, a new industry had been born.



A HULL UNDER CONSTRUCTION IN NO. 4 BUILDING BERTH.

Early in 1917 a permit was taken out for the erection of a shipbuilding slip, mold loft, workshops and offices. On March 1 the floor of the mold loft was completed, and, on the following day, the work of laying down the lines of the steel steamship Alaska was begun. Simultaneously with the construction of the above-mentioned buildings, the piling and decking of No. 2 slip was rushed. During March, the machinery for the plate shed, power house, machine shop and furnaces was installed, and the big plate-bending rolls arrived from Scotland. On April 20, the first car of steel plate arrived, and work on the Alaska proceeded.

The 8,800 Ton Class

The Alaska took the water on January 19, 1918, and at that time was the largest steel vessel ever launched by any yard in Canada. She is a single-screw, two-decked cargo steamer of the forecastle, bridge and poop type, with machinery amidships. Her dimensions are as follows:

Length over all, 427 feet.
Length B.P., 410 ft. 5½ in.
Molded beam, 54 ft.

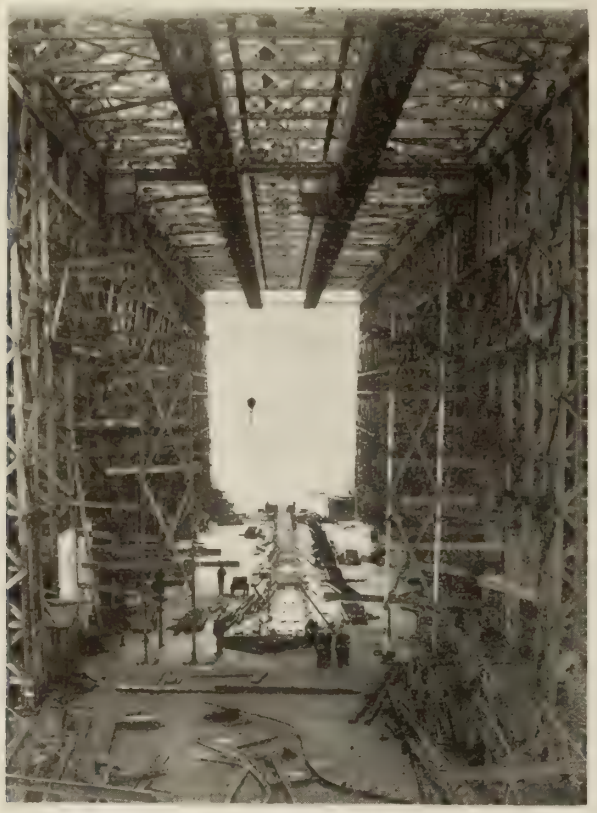
Molded depth, 29 ft. 9 in.

Deadweight capacity, 8,800 tons on draft of 24 ft. 2 in.

Cubic capacity, 490,000 cubic feet.

Gross tonnage, 5,730.

Contract price, $1,452,000.



A BUILDING BERTH IN THE COUGHLAN YARDS. THE PICTURE SHOWS THE KEEL OF AN 8,800-TON STEEL STEAMER LAID.

Figured out in terms of Western products, it is estimated that the ship will carry:

Wheat—293,000 bushels, or 110,631 98-lb. sacks of flour.

Canned salmon—276,000 cases, or 13,250,000 one-pound tins.

Lumber—6,000,000 feet, or sufficient to build and finish 150 average houses.

Horses—1,950.

The ship has five main water-tight bulkheads, and one non-water-tight bulkhead between the engine and fire rooms, and a double bottom constructed on the cellular system. The decks are supported by two rows of widely-spaced, strong pillars, in place of the usual larger number of small pillars of light section, thus facilitating cargo stowage in the holds.

The Alaska is a cargo steamer par excellence and is well fited out with facilities and machinery for handling freight. Four large cargo hatches and one small one pierce the two decks. From the large hatches, cargo is handled by a pair of five-ton cargo booms stepped on derrick-tables on the two steel pole masts. The small hatch has a derrick post with a three-ton boom on each side. For extra-heavy work, a thirty-ton boom is supplied. There are ten cargo winches, a warping winch on the poop, and a quick warping windlass for handling anchors and warping the ship.

The Alaska's propelling machinery consists of a high pressure and a low pressure turbine of the DeLaval type, both connected by double helical gears to the main shaft, the gears reducing the speed of the turbines from 3,600 revolutions to 100 revolutions per minute for the propeller. The reversing turbines are built in the same casing as the main turbines and develop two-thirds of the full speed forward, making manoeuvring easy. The turbines develop 2,500 shaft horse power and give the loaded vessel a speed of 11 knots an hour.

Steam is supplied the turbines by three single-end Scotch marine boilers, each containing 2,670 square feet of heating surface, and having an inside diameter of 14 ft. 9 in. and a length of 11 feet with a working pressure of 190 pounds per square inch. The furnaces are fitted for the consumption of either coal or oil. The bunker capacity is 1,255 tons, giving a steaming radius of about 34 days, or 9,000 nautical miles. The oil fuel capacity is 1,100 tons, which will permit a voyage of 40 days.

Five other ships built from the same plans as the Alaska have been launched from the Coughlan yards as follows: War Camp, March 16; War Charger, July 27; War Chief, August 19; War Noble, September 28; War Convoy, December 18. With the exception of the last-named, all of these have been completed and have stood their trials. Four more ships of the same series are now on the stocks, while the firm has contracts for another four of the same type, but of 8,100 tons deadweight capacity for the Dominion Government's new merchant fleet.

Curtis turbines have been installed in the five sister ships of the Alaska already launched, and Parsons turbines will be used in the four hulls now on the ways.

Building Delayed By Fire

The War Chief was launched in 68 days after the laying of the keel plates, a Canadian record, and the War Noble beat this record by five days. The War Charger was a year on the stocks. She was already to be sent down the ways on May 9, but launching was delayed to carry out some work that could be done more expeditiously on the stocks.



THE "WAR CHARGER" IN ONE OF THE FITTING-OUT SLIPS AT THE COUGHLAN YARDS.

and while this work was in progress the ship was caught in the big fire which swept the yards on May 15. Her port side was badly buckled and over 100 plates had to be taken out and faired. This was a tremendous job, involving the punching out of nearly 200,000 rivets, and it delayed the launching for more than two months.

That fire was by far the most destructive of any Vancouver has known in years, and the damage it did was something in the neighborhood of $1,500,000. Besides, it delayed the completion of much-needed tonnage. In No. 4 Slip, on the day of the fire, the hull of the steamship which was to have been known as the War Chariot, was 75 per cent. plated. Great speed had been made with the work, and it was hoped the ship would take the water in record time. Fate, however, decided otherwise. The flames, which had started on that side of the yard, spread rapidly toward the slip and climbed the timber trellis-work towers to the top. In half an hour the gantry was a ruin, the heavy overhead cranes had crashed down into the hull, smashing the tank-tops, and the War Chariot went through the bottom of the slip, a mass of scrap. The twisted, tangled steel had to be taken out bit by bit, a heart-breaking job which occupied months, and, of course, kept the slip idle, while it was under way. In addition to the slip and the War Chariot, the boiler shop, drawing office and the fitting-out wharf, with much valuable machinery, were destroyed.

The Yard and Building Berths

The Coughlan yards are on False Creek, which may be designated the lesser harbor of Vancouver, and their success has demonstrated the suitability of that waterway for shipbuilding. Vancouver is built on a peninsula, which, in many ways, resembles the human hand. To get an idea of its geography, the reader might place his left hand, palm downward on the table, with the thumb slightly separated from the fore-finger. The hand represents Burrard Peninsula, the headland at the finger-tips being Point Grey. Along the wrist and palm, on the little-finger side, sweeps the Fraser River. On the thumb side is Burrard Inlet, the city's principal harbor. The thumb-nail is Stanley Park, and between the thumb and fore-finger lies False Creek. The business portion of the city and the older residential sections are built on the thumb and about the ball of the hand.

On the south, or fore-finger side, of False Creek, which is here only 1,900 feet in width, is the Coughlan shipyard, which is recognized to be one of the best-planned and most skillfully-laid-out yards on the Pacific Coast. The dominating feature of the yard is the great timber structure which houses the four building berths. This is an immense affair and nearly 4,000,000 feet of lumber was used in its construction. Five lines of huge timber towers stretch back from the water's edge some 600 feet or so, and between each two lines lies a berth capable of accommodating a ship of 10,500 tons. The towers support on their tops a vast framework of girders and cross-beams, strongly braced in all directions, and on tracks suspended from the superstructure move the travelling cranes which bear the building material to the builders. Three of these cranes are installed in each slip. They have a capacity of five tons each and are operated by electricity. They move longitudinally, that is, from bow to stern and vice versa, but each carries a trolley which moves in a transverse direction. It is thus possible, by means of crane and trolley, to swing a plate or bar, or even a bulkhead weighing up to five tons, from any point in the slip to any location on the hull or in its interior. The cranes operate silently, in strange contrast to the terrific clatter of the pneumatic riveters all about, and very swiftly.

Being the dominating feature of the yard, in fact, as well as in appearance, the building berths are placed as near the centre of things as possible. They are on the south side of the creek and face north. Back of them (to the south) and close to the southern limits of the yard, are the offices and tool room. West of the building berths, and west, too, of the tool room is the plate shed. Above the offices is the drafting department, and, opening from this, and extending over the tool room and part of the plate shed as well, is the great mold loft, 260 ft. x 60 ft. On the planed and blackened floor of this loft, the lines of the ship are drawn to full size in plan and elevation.

The tool room is an important adjunct of the yards. It is situated close by the entrance gate, between the time clocks and the building berths. Here, the tools used by the workmen are checked out each morning and checked in again when the shift is over. A workman cannot draw a pay check unless his tool sheet is clean. The system is intended to reduce dishonesty and carelessness as much as possible.

Stock Yard and Fitting Out Slip

West of the plate shed are the stock yards, where the steel plate and angle bars are stored until required. The steel comes into the yards on cars on a standard gauge track, and is unloaded by means of a travelling derrick which moves on a trestle along the full length of the stock-yard. From the stockyard, the material passes into the plate shed. This building contains a 45-ton plate roller, fifteen punchers and shearers, a battery of three spacing-tables and oil-burning plate and angle furnaces capable of heating any piece of steel that goes into a ship. A series of chain blocks, running round practically the entire shed permit of the handling of heavy material rapidly and easily.

West of the stock piles and on the western limits of the yard is a fitting out wharf with a slip on either side. Along each slip runs a standard-gauge switch, and between the two is a building containing a wood-work and pipe shop and a rigger's loft. Back of this building is the machine shop and storehouses. On the east side of the yard, beyond No. 4 Slip, is another fitting-out berth, also served by a standard-gauge track, and equipped with a 75-ton shear legs. It is to this berth that the ships go immediately after launching, and here they have their boilers, tanks and heavy machinery installed. The wood work, rigging and lighter machinery, together with the finishing touches, are added in the berths on the west side.

Outside the yards, but not far away, are the blacksmith shop and the cabinet and pattern shop. The Coughlans build ships, fit them out and install their machinery, but they build none of this machinery themselves. All of it, including the boilers, comes from outside. The firm established a large and complete boiler shop at the outset, but it was destroyed in the fire and has not been replaced.

The Organization

The Coughlan firm is a partnership composed of John Coughlan and his two sons, J. J. Coughlan and S. H. Coughlan. These are the organizing and business heads of the enterprise. The operating executive is John Lockhart, general manager of the firm. Mr. Lockhart is a man of wide experience and has had a notable career as a shipbuilder. He learned his profession on the Clyde and, later, was assistant manager at the Harland & Wolff yards at Belfast, then outside manager for Workman & Clark, also of Belfast. He came to the United States to be general manager for the Harland & Hollingsworth Corporation of Wilmington, Delaware, and in 1916, when the Coughlan enterprise was being organized, he joined the Vancouver firm. He is assisted in his work by H. Bakewell Taylor, chief engineer of the firm, and N. Fraser, the yard superintendent.

ELECTRIC SHIPS AND BRITISH PIONEERS

As the "New Mexico" is the first large battleship fitted on this system, it is generally assumed that the application of electricity to the driving power of ships is an American invention. The pioneer work was however, done by British engineers, notably Captain Durtnall and the late Mr. Mavor, and the first patents for this system were taken out by them. It is to the credit of the American naval authorities that they were the first to try the system. They built a large collier with electric drive and tested it along with a sister-ship fitted in the ordinary way. As a result of these tests, plans were made for much more ambitious equipment on the Dreadnought "New Mexico." Great Britain has, however, to her credit not only the initiation of this revolution but also the building of an early electrically propelled merchant vessel, the "Wansty Castle."

The Foundation Co. Have Two Yards at Victoria

Are Building Twenty 3,000-Ton Wooden Steamships For the British Government—It is Estimated That Monthly Payroll Will Amount to $500,000 Shortly

BARELY six months ago the Foundation Company of British Columbia, Ltd., contracted with the French Government to build twenty full-powered 3,000-ton wooden steamships at Victoria, B.C.

On September 9, 1918, when the last of five 2,500-ton wooden steamships, built for the Imperial Munitions Board, was put into the water, the initial keels under the French contract were laid down at the Point Hope and Point Ellice yards of the Foundation Company at Victoria.

In illustration of the tremendous strides marking the development of the wooden shipbuilding industry at Victoria since the Foundation Company inaugurated its present contract, it might be pointed out that within six months the force of employees, embracing all crafts in the shipbuilding trade, has been increased from a few hundred to three thousand men at a monthly payroll of approximately $400,000.

It is conservatively estimated that the Foundation payroll at Victoria will amount to $500,000 monthly, when the fitting-out of the steamers is gotten under way.

Two four-way yards at Point Hope and Point Ellice are operated by the Foundation Company at the British Columbia capital. These yards, with easy access to the centre of the city, are located on the western shores of the Inner Harbor, formerly known as the Songhees Reserve. The twin shipbuilding plants, equipped with the most modern machinery and the very latest appliances to facilitate construction operations, rival any wooden shipbuilding yard on the Pacific seaboard in equipment, organization and efficiency.

The men at the helm of the Victoria contract are men of wide experience and unquestioned ability; men who have pivoted large undertakings to a successful issue in the service of the Foundation Company in various parts of the North American continent.

The Victoria yards come under the personal jurisdiction of Bayly Hipkins, vice-president and North Pacific Coast manager, with headquarters at Seattle, Wash., and with him is associated E. E. Jenkins, assistant manager on the Pacific Coast. Under the managership of Bayly Hipkins, forty 3,000-ton auxiliary schooners were built within a year at the Tacoma and Portland yards of the company to the order of the French Government.

The resident manager of the Victoria yards is Paul B. Thompson, who, until recently, was in charge of the Portland plant.

Kenneth Macpherson, who served his apprenticeship on the Clyde, is superintendent in charge of construction at the Point Hope yard. William McGregor, who hails from Charlottetown, Prince Edward Island, and who made a name for himself by establishing new construction records at Portland, is superintendent at the Point Ellice plant.

Since the inauguration of the French contract at Victoria, construction progress has been rapid. Eight hulls are now in various stages of advanced construction and by the early part of March the completed hulls will begin to slide down the ways. After the first of the vessels takes to the water, it is planned to launch a vessel every fifteen days. Ten vessels are to be built at each yard and all efforts will be concentrated towards the completion of the score of vessels by the end of the present year.

Particularly noticeable in connection with the Foundation operations at Victoria is the spirit of friendly rivalry existing between the twin shipbuilding plants. Adjacent to each other the yards are operated as independent units, and there has developed a commendable spirit of keenness on the part of the employees of the one yard to outstrip the other.

So close is the construction race that neither yard can show any material advantage.

Under these circumstances it is difficult to predict which plant will secure the initial launching honors. The indications are that the first two hulls will be completed simultaneously, and in that event it is likely that arrangements will be made to stage a double launching.

Three shifts are worked throughout the twenty-four hours. Planking on hulls 207, 209, 216 and 219 is well advanced, and considerable progress has been made in caulking the seams. The hulls are given added strength by diagonal iron strapping riveted flush with the square frames amidships and extending from the keel to the main deck. Another strengthening feature is a steel truss built fore and aft and riveted into the keelsons to prevent hogging. The ceiling of these hulls is complete and the main and poop decks are in. Keeping pace with hull construction the joiner shops are making splendid progress on the superstructure work, and as the decking is completed the housework will be installed in sections. Every branch of the work is being carried forward in a systematic manner to facilitate construction.

With the object of fostering a spirit of fellowship among the employees the Foundation Company has introduced a number of innovations.

The men have their own clubhouse, band and newspaper, which are among the outstanding features of the shipyard organization. The Foundation Club is a novelty in the industrial life of the city. The club idea was born of a desire on the part of the employees for a social and athletic centre of their own. The company co-operated with the men by donating the site and building materials and the employees did their part by contributing to the cost of construction. The clubhouse, situated between the two shipyards, is one of the finest structures of its kind to be found anywhere on the continent.

The general architectural effect is rustic with a low facade opening into a spacious dining hall, which accommodates the many employees who daily patronize it during the lunch hour and on social occasions.

The 2,700 feet of floor space in the dining hall opens directly to an observation gallery overlooking the gymnasium floor eight feet below, where Foundation employees find physical and mental invigoration. At the south end of the gallery entrance is located the men's club room, and at the opposite end of the building is the girls' club room. Both these apartments contain large open fireplaces and are comfortably furnished with lounges and easy chairs.

Leading off the main floor by two broad stairways at either end is reached the gymnasium floor, 80 by 50 feet, the athletic hall being fitted with shower baths and other facilities to make the appointments complete.

The whole scheme affords an example of wonderful co-ordination between employee and employer. The building has all the appointments of a country club.

A brass band of 30 pieces, under the directorship of Bandmaster Lou Turner, is one of the big features of the organization. The members of this instrumental aggregation are drawn from the workers in the shipyards.

The band plays popular selections for the entertainment of the employees at the noon hour.

The Foundation newspaper, "Shipyard Shavings," is published weekly and has a circulation, without charge to the employees, of 3,000 copies weekly. It is a well-edited, lavishly-illustrated sheet, the object being to "boost fellowship and enterprise."

PROGRESS IN TURBINE SHIP PROPULSION

By FRANCIS HODGKINSON

THE high speed turbine with the floating-frame reduction gear, invented by Admiral G. W. Melville and Mr. John H. Macalpine, has proved its reliability not only for use on land, but marine service as well. The records of the Westinghouse Electric & Mfg. Co. show that between November 1915 and September 1918, thirty-one ships using this equipment had been put into service and of these, twenty-three have had no trouble with the propulsion machinery; four experienced some trouble due to improper lubrication; two to defective material, and one to errors in assembling the apparatus. None of these troubles was vital and all were of a kind that might happen to any machine.

As large turbines are now being built which can deliver to the shaft about 80 per cent. of the energy theoretically available in the steam supplied to them, it is evident that further improvements in the turbine itself will not materially raise this efficiency. Hence in order to improve the performance of the ship's power plant, a matter of great importance in view of the rising cost of fuel, we must pay more attention to the auxiliaries and study the practice of the central station engineer, who has been able to obtain excellent results in the reducing of power costs.

Economizers

Economizers do not appear to have been used on ships, but there seems to be reason why they should not be applied on express steamers where they should permit a net gain of about ten per cent. in fuel consumption.

Superheat

Superheat has never been recommended in connection with the old slow speed direct-connected turbines, but superheats of as high as 100 degrees F. should present no difficulties with the high speed geared marine turbine. This should save some 4 or 5 per cent. of fuel.

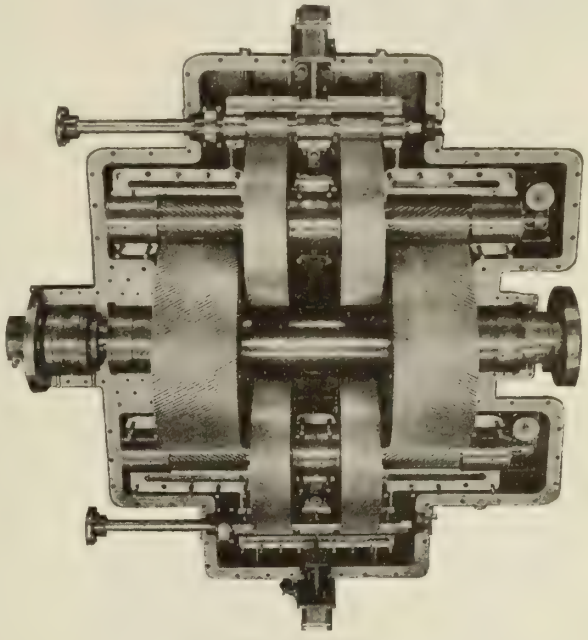
Condensers

With a properly designed turbine the steam consumption will be 7 per cent. better with 29 inches of vacuum than with 28 inches. The desirability of the use of such a vacuum is therefore obvious, but it can only be obtained when the most efficient condensing apparatus is used and when the greatest care is exercised to prevent air leakage.

Abstract of paper read before the Society of Naval Architects and Marine Engineers, Philadelphia, November 14.

Oiling Systems

The oiling system is vital to the proper operation of the turbine and too much attention cannot be given to the layout of the system so as to insure an extreme degree of simplicity and reliability. In an ideal system, the oil pumps should be placed at as low level as possible; the drain tank should be large and thoroughly drain the turbines through large-sized pipes; the pump suction should be placed several inches above the bottom of the drain tank so as to avoid drawing dirty oil, but an auxiliary suction should be provided also that the tank can be completely emptied for cleaning; the pump should discharge through coolers into an overhead gravity tank located some 20 feet above the machinery; duplicate coolers should be provided so as to permit either one to be cut out of service, the oil pressure in the coolers should be higher than the water pressure so that no water can mix with the oil in case of a leak; the overload gravity tank should be supplied with a strainer and should contain a float-operated valve for controlling the speed of the oil pumps; and arrangements should be provided so that the presence of water in the oil can be immediately detected.



GEARED TURBINE.

Turbines

Cross-compound turbines, in which the steam regularly flows first through the high pressure cylinder and then through the low pressure cylinder, are essentially designed for vessels which always operate at their maximum speeds. Where cruising speeds are required, the divided flow turbine is applicable. In this type all the steam passes through an impulse element in the high presure cylinder and then divides, one portion continuing through the high pressure cylinder to the condenser and the other portion going through a separate low pressure cylinder and then into the condenser. For cruising, the low pressure cylinder can be cut out of service. This arrangement is also adaptable to constant speed steamers. It will give nearly as good performance as the cross compound type and has certain constructional advantages.

Continued on page 77



"MAHMANGER" TANK SHIP WITH GEARED TURBINES.

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The Eagle's Wings Are Flapping

THE following article appears in a recent number of a prominent New York shipping journal:—

When we say we need a great navy for our ever-increasing national responsibilities we are apt to think of it practically in terms of ships only, sometimes forgetting that ships are merely as useful as men make them. The parade of blue jackets in this port last week on the return of the battleship fleet to home waters brought the fact to our minds that the men who command our ships, the men who man them, and last, but not least, the men who build them, are very great factors in a great navy—factors that America is particularly fortunate in possessing to a degree incomparable by any other nation. The story is not yet published of what our navy did in the war that has just been brought to an end. When it is, the old saying that formerly we had wooden ships and iron men, while to-day we have iron ships and wooden men, will forever go into the discard.

Never before has the personnel of any navy been called upon to fight an unseen enemy. This was an entirely new feature of warfare on the sea We hear a great deal about England's grand fleet having bottled up the German fleet in Kiel Canal This was regular naval work such as had been done by fighting ships for ages. To combat undersea craft, however, that made no pretense of attacking naval vessels, but bent all their energies to sinking troop ships, was the unique work laid out for our submarine hunters to perform, and they did it so effectively that within about nine months after they started in the tide had been turned against the U-boats, which when the first convoy of troop ships landed on the other side in June, 1917, had a strangle hold on shipping in the North Atlantic.

No wonder, then, that crowds of American citizens heeded not the rigors of a December snow storm, but stood for hours exposed to the elements all along our water front to welcome home our sailor boys, our first line of defence always against a foreign foe.

The tendency in the United States press has been, recently, to allow a full meed of credit to the performances of the British navy during the war. It is disappointing to find an editorial writer, in a paper devoted to maritime news, who evidently looks upon those achievements as practically negligible, consisting merely in performing blockade work, such as has been performed from earliest naval history. According to this gentleman, it was not till the war had been in progress nearly three years, and the United States made their tardy appearance in the conflict, that anything was done to combat the submarine.

This is either wilful blindness or a case of the eagle spreading its wings so wide that it draws its eyelids down.

The British navy and British mercantile marine fought the submarine and carried troops, ammunition and supplies all over the seven seas, and cleared the German flag off the face of the ocean. They developed means of combating the submarine which were many and various. The Q-boat was not a Yankee invention. Neither was the depth bomb. If nothing had been done to check the submarine before the United States took part the American army and navy would have never left their native shores.

We honor the war effort of the United States, and give credit to their gallant men. We feel, at the same time, that those same men would be the first to resent this veiled sneer at their British comrades whom they have learned to respect.

Eastern Canada Marine Activities

Doings of the Month at Montreal and on St. Lawrence River

(February Correspondence)

THE proposal to construct a joint canal between Montreal and the Great Lakes has not met with much approval by business men of Montreal. The scheme has been considerably talked of in United States shipping circles, but from those who have studied Canada's needs in this respect, the comment has not been favorable. Speaking on this matter, Thos. Robb, president of the Shipping Federation of Canada, said: "I am of the opinion that the people of Canada will vigorously protest against any scheme that may involve this country in the construction of such a canal, in view of the fact that the plans for the Georgian Bay Canal are now well advanced." Mr. Robb emphasized the advantages of the Canadian project, stating that the entire course of the waterway was on Canadian territory, while that of the newly-proposed canal would be on the international boundary, a feature that would cause considerable inconvenience in event of a squabble or dispute. It would likewise mean the giving up of the Georgian Bay plan and the waste of money already spent in this connection.

It is more than likely that the big cold storage plant to be erected in Montreal will be started during the present year. The site has been chosen and the plans have been prepared, with everything apparently waiting the final action of the Government in approving the undertaking and taking decisive action. The location of the plant will be just inside the Victoria Pier. The proposal to build the plant is not new, as it was part of the initial programme of the Montreal Harbor Commissioners, in which an expenditure of $25,000,000 was the goal. If present plans are carried out, this big storage plant will have no equal in Canada; every modern appliance will be incorporated to facilitate its successful operation. Immense elevators will be placed in the plant by means of which whole carloads of stuff will be lifted up to whatever floor of the building it is necessary to take them, where the cars will be unloaded and then lowered back to the tracks again. A similar process will be followed when stored stuff is to be taken out; empty cars will be elevated to the floor desired and loaded, thus eliminating much of the handling that is necessary in other plants. It is pointed out that if the work is actually begun this spring, it will do much to relieve the labor situation in the City of Montreal which exists at the present time.

A co-operative movement between the express companies and the shippers is now under way for the betterment of express service. Committees have been formed whose duty it will be to watch conditions and suggest improvements for more efficient service. Better marking and packing is advocated; the use of tags is not encouraged, and where such are used, two should always be attached to eliminate delays in shipment from loss or mutilation.

The Montreal General Tool Co. of Montreal are now manufacturing the Talbot Contra-flow boilers, and the Talbot Uni-flow engines, the Canadian rights for which have been secured by C. L. Dixon, president and general manager of the above company. During the period of the war, Mr. Dixon was works manager and production engineer of the P. Lyall and Company munition plants, where he enjoyed an enviable production record.

Work on the eight 1,500-ton wooden barges for the French Government is proceeding with satisfactory progress at the yard of Fraser, Brace & Co. The keel for the last of these has recently been laid, and the three first laid down are about ready to take the water, and before the end of the present month it is expected that these will be placed in the water. The three now ready are on the floor of the basin, so that in order to launch them, all that will be required will be to permit the water from the canal to flow into the basin, and the rise of the water will float the vessels. In the case of larger vessels recently completed for the Imperial Munitions Board, it was necessary to flood the basin to a depth of about four feet over and above the normal level of the canal; in the present instance, however, this will not be required owing to the small draft of the lighter vessels. The ice in the canal will be broken so as to provide open water for the taking out of the boats, after which they will be placed alongside of the canal bank for the installation of the machinery and final fitting out. As soon as the water has again been pumped from the basin, the keels of three others will be laid, and it is anticipated that these, together with the others on the higher level, will be ready to take the water early in the spring. A retaining wall has been built along the north side of the basin giving what will eventually be a dry dock about 65 feet wide by 600 feet long. In the spring, after the present order is completed, an additional excavation will be made to give about four feet more depth to the basin.

In recognition of the valuable and splendid services of the British sea power and the interests of the Navy League of Canada, special service decorations have been conferred on M. P. Fennell, Lady Meredith, and James Carruthers, by the executive of the Navy League of London. Mr. Fennell, the secretary-treasurer of the Harbor Commissioners of Montreal, has been associated with sailors' activities all his life. He is a life governor and director of the Montreal Sailors' Institute and Catholic Sailors' Club, and, upon the founding of the British Sailors' Relief Fund in 1916, he organized branches of the latter in virtually every city and town in the Dominion, and subsequently made a second trip for the purpose of forming divisions of the Navy League. He was the first honorary secretary-treasurer of the league, but recently resigned this position owing to the pressure of business in connection with harbor work. James Carruthers is the first president of the Quebec branch of the Navy League and was also vice-president of the British Sailors' Relief Fund. Lady Meredith is the first president of the first ladies' branch of the Navy League of Canada, and her organization during the past year has shown the greatest number of members of any branch in Canada as well as the largest provider of comforts for the men on the warships and merchant marine.

Officials of the Halifax Shipyards recently inspected the construction work at the site and were well pleased with the progress that is being made. Excavations and the preparation of the yard are proceeding rapidly, and all the buildings are expected to be under way by the first of the month. The first two boats to be built will be of 8,100 and 10,000 tons, and the keel blocks for these are already in position, but the laying of the keels is being delayed owing to the non-delivery of the necessary material that is to be supplied by the Government. The rebuilding of the Lake Manitoba is proceeding favorably, and it is anticipated that the vessel will be completed before the time specified. The foundations for the power plant will soon be started; this will have a capacity of 3,500 h.p. and will be so constructed as to burn coal or oil. The managing-director, R. M. Wolvin, has recently sailed for Europe and he expects to be away for several months.

At the recent annual meeting, the Dominion Council of the Navy League of Canada, the following resolution was placed on record and will be forwarded to the Federal Government for their approval and consideration: "That the Navy League of Canada is in favor of a naval policy for Canada, which will have regard for the needs of the entire

British Empire, and in deciding upon such a policy, political exigencies should be disregarded and the opinion of the most eminent naval strategists alone considered.

"And the fundamental idea will be Empire naval defence, and that the fleet units may be either acquired or built, and that the Dominions shall retain control of their ships, and that there shall be a complete standardization of their personnel, ships and equipment, and that the whole shall be of the best, and that in times of war all the fleets shall be under the one supreme command."

According to a statement recently made by Sir Ashley Sparks, K.B.E., of the Ministry of Shipping, and managing-director of the Cunard Line, on his arrival at Halifax, the transfer of merchant vessels from the British Government to their original owners will be carried out immediately, and it is expected that this will be virtually completed early in March. The supervision of the operation of these boats will still remain under the control of the Imperial authorities as it is imperative that the transportation of troops be continued with all possible dispatch. For an unstated period the large vessels that have been coming to Halifax will be transferred to the New York route as this is more in keeping with the demobilization plans of the two Governments.

Greater economy in ocean transportation was the subject of an address given at a recent meeting of the Engineering Institute of Canada in Montreal, by A. W. Robinson, M.I.C.E. Mr. Robinson was of the opinion that under the changing conditions and the imperative necessity of increased efficiency in all walks of life, that in the construction of permanent tonnage, and in fact all ships now building, it should be the universal practice to so construct the vessels that they would be suited to carry the cargo and load and discharge the same with the least possible cost. In view of the higher costs of construction and operating costs it would be advisable to study the facilities that are being provided for the handling of the cargo when the vessel is in port. Uniform methods, as far as possible, should be adopted at every port of call to facilitate the work and reduce the time required for the loading and unloading of the cargo.

GENERAL OAKUM CONDITIONS

One of the most important materials produced in this country for use in shipbuilding is oakum. It will no doubt prove of value to the consuming trade of the country, which has increased to rapidly and so very greatly during the past year, to know what the present conditions are and what they are likely to be in the next few months, and with this idea in view, a few of the most important factors affecting the production of oakum have been given attention and the results of the investigation will prove interesting.

The question of labor is of course the most important and of necessity will affect the cost of production more directly than any other one item. It develops that the manufacturers are not considering the lowering of wages at this time and are thankful that they have been able recently to get their full quota of men to operate their plants at the highest point of efficiency. One plant we know of has put in a new bonus system to stimulate production, preferring rather to keep their labor satisfied and keep costs down by the greater output. Unless labor becomes so plentiful that the supply exceeds the demands there is no likelihood of any decrease in wages, and for the present at least there are no signs of this condition existing very soon.

The next important factor in the cost of production is the raw material. It develops that the manufacturers are buying to-day their raw material at the same prices as they did last fall with no prospects of prices going off. On the other hand a condition is developing in the raw material market that will tend if anything to increase the price of raw material rather than to reduce it and we have in mind the situation in Russia. Prior to the war, England and the European countries drew on Russia for a large part of their supply of hemp and tow. This supply has gradually diminished until to-day it amounts to practically nothing and foreign consumers have turned their attention to this country for their supplies and already England is buying in this country and it is expected before very long that the movement of hemps and tows from this country across the Atlantic will be very great and before the 1919 crop is ready for the market supplies will be in such demand that prices which now seem high will be low in comparison.

We find that the oakum buyers are inclined to hold off at this time believing that the prices of oakum will go off and justify their position by referring to two conditions which they believe represent reasons why the prices should go down. The first is that rope has declined in price and shows a tendency to go even lower. As a matter of fact the movement in the price of rope bears no more relations to the movement in the price of oakum than leather or automobiles do. Rope is made from a hemp that is not used in oakum, the greater part of it comes from Manila and the principal reason for the high cost of rope was due to the high freight and insurance rates which prevailed, these are about back to normal again and there will not be a very marked change in the price of rope again unless the demands exceed the supply and this condition can easily exist while foreign conditions continue to exist as they do.

The second reason that buyers feel that there are going to be lower prices is from the fact that they have received much lower quotations than have been prevailing. We would warn buyers to be very careful about buying oakum that is offered them at prices something like a third less than the market or even three or four cents per pound less than the market. At the beginning of the big boom in shipbuilding in this country, when it looked as though every vessel was going to be built of wood, many plants which had never made a pound of oakum in their history began to produce what they called oakum and large quantities of this was sold to the new yards and builders who did not know what oakum should be, with the result that when it came time for the oakum to be used in the seams the inspectors condemned it and it was thrown back on the hands of the manufacturers. There is a very large quantity of this oakum in the country now and the owners are using the cry that prices have gone off to get the buyers to take this oakum at the lower prices. In some cases it is being offered as a surplus stock of the Red Cross, the argument being given that the oakum was used by the Red Cross for surgical dressings and of very superior quality, when as a matter of fact. the oakum is not fit for marine uses in any place.

To sum the situation up, it looks very much as though the price of oakum would remain at its present level for the time being and if there is any change it will more likely be up than down and the best policy to follow is to keep in touch with one of the older manufacturers whose reputation for many years has been built on quality and whose quotations would be right for the material supplied.

AN INTERESTING JUDGMENT

A case of interest to all those who have occasion to entrust repairs to an engineering firm, without making a definite contract, was decided at Montreal recently by Mr. Justice McLennan, sitting in the Admiralty Court. This was an appeal taken by the owners of the "Susquehanna" from a judgment in favor of the Canadian Vickers, for the cost of repairs made to this vessel. The amount claimed was $52,983.34, and the appeal judge reduced this amount by $17,000. The repairing firm's statement showed that material plus 5% handling charges came to $6,665.43, and the labor to $14,-905.73, and the total claim amounted to $53,541.21.

After pointing out items charged to "overhead expense" and one of 47.3% net profit, the judge stated that the burden was on the plaintiff to establish that its account represented the fair market value of the repairs. If the cost were definitely ascertained a net profit of 12½% would have been fair and reasonable. If the average of the overhead charges to others as just stated was added to the charges for labor, and a net profit of 12½% added to cost of material, labor and overhead so ascertained, the total would be under $35,000, which was the amount estimated approximately by the plaintiff's works manager, and manager before the work was undertaken. The judgment was in favor of the appellants for $35,080.

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"*

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

STORAGE OF CARGOES AND THEIR PROTECTION

By "THE SKIPPER"

THE Canadian merchant marine is not only growing, but it finds itself filling new duties. Men who were accustomed to lake routes only, and, of course, to inland water conditions, are now getting acquainted with coast routes on the Atlantic, whilst hundreds of young men who have served so faithfully in the Naval Patrol service are aiming to enter the ocean steamers and work their way up to captain. To the junior mates falls the responsibility of cargo supervision, so an article on such work may not be amiss.

As the premier function of merchant ships is to carry cargo, or passengers, it is sound logic for every young officer to bear in mind that he is in charge of life and property. We will concern ourselves with the property—better known as cargo.

The great aim in all transportation, and more so in water carriage, is to prevent damage or deterioration, and deliver, as far as possible, the goods just as you received them. To accomplish this you must know the ins and outs of storage and preservation.

Preliminary

The first thing to be sure of in loading any cargo is to satisfy yourself that the ship's holds are ready. See that the bilge chambers on the port and starboard wings are thoroughly cleaned out, so that any water from the tank tops or cellular bottom can find its way to the proper place—either the engine-room well or the nearest rose-box on the pumping unit. The stringers must be cleaned and show no signs of the previous cargo.

If the incoming cargo is "general," that is, miscellaneous, a certain amount of dunnage must be laid on the floor, say 5 or 6 inches on the tank tops and 9 or 10 inches over the wings or limberboards. Lay the dunnage athwart-ships that leakage or sweating may get a free run to the sides. If bales or bags are apt to touch bare iron such as stanchions, either bagging or matting must be wrapped around the columns.

Dunnage

Dunnage is simply pieces of wood, generally from 3 to 6 feet long and of various thicknesses. Besides its use on the ship's skin or floors, it comes in handy, where an unavoidable space has to be filled up in the cargo-hold, to prevent the movement of merchandise. In Eastern countries, bamboo and mats are used extensively in loading such cargoes as jute, rice, manilla, copra, sugar, etc. Then again, for some cargoes dunnage is not required at all, for instance, coal, ore, pig-iron. Such cargoes as the former generally fill a ship up, and only cause worry in connection with spontaneous combustion. The ore and pig-iron class of cargoes are simply dumped into the holds and allowed to form pyramid shaped heaps. Their dead-weight and stick-together qualities prevent them from shifting, and they are not destroyed by sea water or bad ventilation.

Sweating and Ventilation

On ocean voyages, sweat from the iron decks and sides can play a great deal of damage to certain cargoes, hence its prevention must be practised. The sweat, of course, is caused through the difference in temperature between the air in the confined hold and the air on deck. Through taking a hatch off here and there and attending to the ventilator cowls—trim their mouths to leeward the sweat nuisance should be kept within bounds. Where possible, send the carpenter or boatswain below-decks once a week to report on the effects of any sweating that may be going on.

Spontaneous Combustion

If the cargo is coal, a few readings of the thermometer should be taken daily. If you have no special tubes for the purpose, drop your thermometer down the ballast tank, sounding pipes. Take one reading from the ship's floor and one half-way up—say about the 'tween-decks. When coal starts to heat itself, stop all ventilation and flood the holds with live steam.

Where the coal is of a nature given to spontaneous combustion, the colliery shippers should notify the captain of the ship as to its likelihood. Both the conditions of mining the coal and its record on the railroad have a bearing on its ultimate behaviour. Slack coal that has got wet is more susceptible to gas and to heat itself than larger coal that has come on board dry.

There is no special period of time in which one may assume immunity from spontaneous combustion. It is recorded that ships have blown their hatches off before putting the land below the horizon, while the writer knows of vessels that have been as far on their voyage as the Southern Hemisphere from Great Britain before the fire fiend broke forth. In iron or steel ships, where the heating is confined to one hold and iron bulkheads prevent its spread fore and aft, it is sometimes good policy to jettison a few hundred tons. Where this can't be done, proceed as mentioned already by excluding all air and introducing water or steam. In using steam the decks and topsides will get very hot, although the real fire may be in check. It is possible, even a common occurrence, to steam or sail for days and weeks with a smouldering volcano in the holds, many vessels arriving in harbor with the cargo on fire.

Other Combustible Cargoes

Cotton is famed for firing when in a ship's hold, and it is so important that this cargo be kept free from any contact with oil, that even the negro stevedores cannot use an oil can to lubricate their tier screws when loading cotton in Savannah, Wilmington, or New Orleans. Underwriters have had more trouble with cotton cargo fires than coal, and occasionally jute from India plays the same tricks.

Storage Queries

What are shifting boards?

They are boards which fit the vessel's hold in a longitudinal or fore and aft line, dividing the cargo in two, and preventing grain cargoes from shifting with the roll of the ship.

What is a cargo plan?

A drawing of the ship's cargo spaces, with the location of different parcels of merchandise, especially when the ship is bound to more than one port. Say that you were loading in Vancouver for Madras, Rangoon, and Calcutta, you would necessarily have to load the goods in the proper rotation, so that no cargo had to be over-carried. Should stuff be carried past its proper port, the cost of transhipment must be paid by your owners

It is impossible to lay down concrete rules for the loading of ships, as each vessel has peculiarities all her own, but the writer wishes to open up the different lines of thought and reasoning that a junior officer must work out according to the craft he joins.

For instance, in a mixed cargo, the heavy goods must be put in the bottom of the hatchways, and always in the midship hatches first. This principle puts lighter stuff in the end hatches. But the grand goal is to make your ship behave well at sea, so to some extent, unless it's the ship's maiden voyage, you must get to know whether she is a "stiff" ship or a "tender and cranky" ship, and be guided thereby. A "stiff" ship can take heavy goods in her 'tween decks, while a "cranky" vessels needs, if possible, the great bulk of heavy stuff as low as it can go. The happy medium must be found out by experience, and while the chief mate is really in charge of such work, the juniors must show their knowledge and give their attention to the matter. Always bear in mind that the stevedore and cargo lumper go home when the ship is loaded, whilst you proceed to sea in her and reap any harm or subsequent damage that bad stowage may bring on.

Supervision of Holds

During loading it is well to visit each hold frequently and see with your own eyes the placing of different class goods

If directions are printed on a box or bale, make the stevedore carry the instructions out. It may be requested that a certain package be stowed "This side uppermost," or "Stow away from the boilers." Where a bale comes down the hatchway you may notice that "No cargo hooks to be used" is printed on it. Then the marks and numbers on goods must be easily recognized when discharging, and the only way to have that condition in ship-shape order is to see to it when loading.

Liquids in barrels are best in the ends of the ship, where any leakage will go immediately to the tank tops instead of percolating through a mass of other goods.

Dangerous acids must be stowed on deck ready for dumping overboard. Liquid ammonia or vitriols are in tsis class.

Special magazines for gun powder or dynamite are built generally in a hatchway by competent men that do such work right along, and the explosives are loaded and discharged under strict port authority away from all ordinary docks and piers.

Give an instance of how the procedure in loading two ships differ owing to their construction.

Answer.—The case of one vessel being built lake fashion, that is, all engines and bunker space right aft, while the other ship had those weights and spaces amidships. The lake craft is like an ice-breaker when in ballast trim, while the ocean tramp is practically on an even keel. It goes without saying that each vessel is a proposition in itself when it comes to loading them to a seaworthy draft.

In different parts of the world you will find different port rules and laws which you must conform to, but none of such laws or authorities take the blame of the results of bad loading. That must be carried on the mates' shoulders, and for that reason alone, it behooves the junior officers to sharpen their wits along such lines.

Say, for instance, that you load a cargo of spruce deals down in Rimouski anchorage in the St. Lawrence. Now, this cargo will be piled up at least 10 or 12 feet on deck, and you have to cross the North Atlantic with it. The stevedore bunch generally consists of a Quebec Irish foreman, and his gang are French-Canadians and half-breed Indians —all good workers if you insist on having your say in regard to stowage.

Naturally, the deck cargo is the precarious part of the ordeal, such things as watching the draft having no place till very late in the game. After putting two old tarpaulins on the hatches when they are full, see that cross deals are fitted in from the hatch combings to the bulwark, but that their ends do not block a scupper. Then let the boys lay the timber fore and aft, just as they did it in the holds. Meantime, mark the main rail with chalk where you wish the uprights to go in, and the sooner they go in the better—say every three feet apart.

Chain or wire lashings do not prevent the cargo from being washed overboard if the weather is exceptionally bad, but these lashings are very necessary for binding purposes and act as an ordinary safeguard. The writer once lost half of the fore-deck cargo off Anticosti Island in a gale and had to jettison a similar amount from the after-deck load to trim the ship, so that the damage is not always done on the broad Atlantic, for the above mentioned island is well inside the Gulf of St. Lawrence.

Great caution must be taken in enclosing the deck winches with such cargoes and as your own seamen generally drive the cargo winches in such ports or roadsteads rather, a hint to these men as to what to watch out for is never amiss. As regards the ballast tank air pipes, which must, of course, be covered up and out of reach, it is well to unscrew the caps and keep them in the wheel house; they are brass and will do the compass no harm. If the air pipes are near a bulkhead or winch, put a pole in the whole, which you can operate from the deck load, for one never knows what you may have to do in regards to emptying or filling a tank at sea, and if the caps were screwed down and covered up, the fat would be in the fire. Any leakage from main deck water that may find its way down these pipes must just be pumped out when the carpenter scores it up on the engineer's tank record in the morning watch, or again in the dog-watch.

The steering rods that run from the midship wheel house to the poop have to come in for strict attention in carrying deck loads, and as every vessel has the rods differently fitted, one must just use the discretion necessary. Where the rods are carried under the main rail the chance of damage is very little, but in some timber carriers a gutter-way has to be made in the centre of the deck load for the rods. These are very vital points for mates and the safety of the ship, but naval architects sidetrack them for want of practical knowledge. If some of these gentry had to skull the ships they design over the seven seas, they would get a few pointers that are not centred in the main hatch, which, of course, is their pet hobby.

Ships carrying timber are well served by the fo'c'stle head breakwater, a stout timber in the shape of an inverted V and built into the deck abaft the windlass. This breakwater throws a head sea overboard before it has time to go up against the fore-deck load and rebound into the fo'c'stle doors, and perhaps drown the men in their bunks.

Tricks of the Trade

Every route and port has some tricks of its own, where the mates in relation to loading and discharging cargo must be wide awake.

For instance, always when receiving cargo make sure by reading the wharf, dray, or box-car receipt that the goods are really consigned to your ship—the S. S. "Trafalgar," for the barge "Mary Jones," or the ship "Trade Winds" are also on the loading berth a stone's throw down the dock. Mistakes of this kind have happened.

Then, should your eye catch a damaged bale, a leaky barrel, a broken box, have it put on one side for inspection.

You must really be a detective in some ports, where it is the custom for a shore tally-man to count over with the mates, perhaps, five or six hundred bales of cotton in a shed, and then get a signature from you that the number is correct and the merchandise in good order. Now, what is to prevent a happy-go-lucky teamster with a dusky hide and two lanky mules from helping himself from the back of the warehouse. This is mentioned just to show how far-reaching the cargo business is.

Take another trade, case oil from New York to Hong Kong. The mate signs on this continent for so many thousand cases, but how many does he tally out when his juniors are set to work with Chinese tally-man? No ship that I ever heard of has managed to count out the same number of cases in Hong Kong as they signed for in New York. Of course, the smartest mates get the best results. Take coal from Australia or Britain to South American ports. The bills of lading stipulate so many thousand tons as per railroad freight weights. Where is the vessel in Valparaiso or Callao or Rio that gets the equivalent figures? She's not launched yet. You had the same kind of trouble on the lake boats a few years ago with Port Arthur against Buffalo or Kingston bushels. A ship would leave the head of Lake Superior with 200,000 bushels of wheat, and when it was measured in Montreal it would be so many thousand bushels short. The mates in this local dispute were exempt from blame, as they do not carry the same responsibilities for cargo as the salt water men do, but as I said at the beginning, the lake men and the ocean men are fast becoming one body, and it will, perhaps, be less than a decade when our Canadian ships go right from Port Arthur to Manchester or London, yes, and manned and officered by Canadians.

Just another crack of the whip to show how important cargo supervision is. The writer, when second mate of a large tramp, was flopping around the holds one day in Mobile, Alabama, when he heard a trickling noise of running water. A stream, of course, make such a commotion against any ship's side, but it was more than the passing river water.

It was in this particular case a leaky plate-butt which had been damaged in bumping against some dock, and the water was rushing in at a fair clip. It had just started as the faulty plate became submerged with loading, so the ship was immediately heeled or listed and the gaping seam caulked by a good chief engineer, who was not too proud to

go over the ship's side in a bowline and do the job himself. As we were loading flour at the time you can imagine how we would have fared in going to sea in such a condition. Mark you, this leak was not visible until one actually peeped behind the cargo battens that run along the ship's side.

SHIPBUILDING PROSPECTS IN BRITISH COLUMBIA

J. J. Coughlan, of John Coughlan and Sons, is Not Optimistic

RECONSTRUCTION simply means a readjustment to the new conditions and Canada, by her war performances, has already shown the wonderful adaptability of her people.

Any business, trade, or occupation, which owes its inception in any locality purely to war conditions, should not be relied upon as a basis of peace prosperity. Ninety per cent. of the activities so created will inevitably cease to exist within a short period after the cessation of the war impulse.

Trade, under peace conditions, will rapidly return to the more natural pre-war channels which were very well and stably established, based upon geographical and economic conditions.

British Columbia is fortunate in that she is not extensively dependent on business born out of war conditions, but rather upon the development of her own resources and her seaport possibilities, these forming the real basis of the future prosperity of her people.

Shipbuilding is probably one of British Columbia's largest war-born industries, and having been war born cannot be expected to long endure after peace conditions. I estimate the life of steel shipbuilding in British Columbia at a maximum of three years and do not believe the sound of rivets being driven in new steel ships will be heard to any appreciable extent thereafter, and unless railroad freight rates on commodities entering into the construction of steel ships are lowered and British Columbia labor materially modifies its views and attitude, I shall be surprised to see the industry endure one-half that length of time, if indeed it lives at all beyond the life of the present contracts.

The exigencies of war have caused many extravagances in shipbuilding, resulting in the feeling that the industry is capable of bearing almost any cost burden that can be imposed upon it. This was true to a considerable extent while the necessities of war compelled the construction of ships at no matter what cost, but now that that crisis is passed, low cost is the vital factor that is required for the permanent life of the industry on the Pacific Coast, and particularly in British Columbia, which stands at great competitive disadvantages and is not favored with the protective measures extended to American Pacific Coast ship builders by the American Government, which has in every case, since its entry into the war, paid such wage advances as have been granted to the shipyard employees, thus saving the shipbuilders from losses in this direction, which in the case of Canadian shipbuilders had to be borne by themselves.

Both shipbuilders and their employees must in future be prepared to either produce vessels at a comparatively low cost or alternatively be prepared to go out of the ship-building business.

British Columbia, in a shipbuilding way, stands before the world to-day with a rather blackened character on account of extensive labor troubles and other causes that have tended to both delay the delivery of ships and to make the cost thereof extremely high. Without the pressure of war requirement purchasers will be extremely reluctant to pay any more for a ship built in British Columbia than it can be purchased for elsewhere, and the world's productive capacity in ship construction has increased so tremendously during the war period that shipbuilders favorably located insofar as source of supply of the component materials entering into a ship, and insofar as more satisfactory labor conditions are concerned, are in a position to build ships both at a low price and for rapid delivery.

PROGRESS IN TURBINE SHIP PROPULSION

Continued from page 71

A modification of the divided flow type is the series divided flow turbine, in which certain of the turbine elements are operated in parallel for maximum speeds and in series for reduced speeds. This obviates the use of a separate cruising turbine.

For patrol boats and cutters an exceedingly simple form of turbine has been designed. It consists of a single re-entry impulse wheel with reversing buckets cut in the shrouds of the ahead blades, and with steam pressure of 330 pounds and 27-inch vacuum, the steam consumption by actual test is 14.9 pounds per shaft horse-power hour at 600 horse-power.

Manoeuvring Valve

It is frequent practice to provide two valves, one for ahead and the other for astern, but as this arrangement is somewhat inconvenient and permits both valves to be opened at the same time, the Westinghouse Company prefers to provide a single valve which controls the steam in both directions and is more easily manipulated.

Electric Drive

There is much difference of opinion as to the relative merits of the electric and the geared turbine drive. Electric drive is being installed on certain battleships and while its operating success is certain, the question as to whether the increased complications, increased cost and weight of machinery, and increased steam consumption per propeller horse-power is warranted, can only be answered by future developments.

One system of electric drive has been proposed which has promise of excellent economy. This consists of the use of a number of small Diesel engines, with cylinders not greater than 10 inches in diameter and therefore well within the limits of reliability, each of which is to drive a small generator. These units can, of course, be located anywhere in the ship.

Feed Water Heating Systems

A much desired system is one that will automatically maintain a predetermined temperature in the feed-water heater at all times, bleeding from the main turbine when more heat is needed and permitting surplus steam from the auxiliaries not condensed in the heater to re-enter the turbine and do useful work. Such heat balance systems have been used on land for some time and should be developed for use at sea. Automatic valves that maintain the proper steam pressure and temperature balance are already available.

With the advent of turbine-driven auxiliaries and electrical winches all of the exhaust steam produced can be kept free from oil so that the less expensive and more efficient open type of heater can be used in place of the standard marine tubular type.

Steam Pressure

Central station engineers are to-day considering the use of steam at pressures as high as 600 pounds because of the higher operating efficiency thus secured.

HEAT LOSSES IN GENERAL

Heat is wasted in many ways, in the operation of steam boilers, and it often happens that the significance of the waste is not appreciated either by the boiler owner or by his employees. Heat is an invisible, intangible thing, but its generation costs money, and the loss due to its waste is just as real and important as it would be if the escaping heat were composed of pennies or dollars. It is well worth while, therefore, to consider every source of heat waste that can be discovered in the plant, and to consider what means should be taken to reduce the loss to the lowest appreciable point. The commonest sources of heat waste about the boiler plant are mentioned below.

Vancouver, B.C.—The Northern Construction Co. are constructing an addition to their yard, to cost $44,000. This company is building 5 vessels of 1,500 tons d.w. for the French Government.

Talbot Boilers and Engines Made in Canada

Improved Design Results in Saving in Space and Increased Efficiency Over Standard Types of Boilers and Engines—A Description of the Contra-flow Boiler and New Uni-flow Engine Uni-flow Engine

THE developments and improvements that have taken place during the last generation in the manufacture of boilers have been confined very largely to construction details and arrangement of parts, but the principles involved in carrying large volumes of water, with circulation by gravity, has remained the same in all of them, and to some extent the advancement in steam generation has not kept up with the general march of industrial progress; therefore the contra-flow type of steam boiler, with the water spread over a thin film over the surface, represents the last word in the known science of boiler construction. A boiler of this kind occupies about one-seventh the space per H.P. of that required for a Scotch boiler of the same capacity, thus permitting of additional cargo space, or small vessels for stated tonnage. In these oil-fired types of boilers no brickwork is necessary, and with the saving of space it is claimed that they can be operated cheaper than any known power-producer. Automatic control minimizes the labor factor, as one attendant can easily take care of a large group or battery of boilers.

The Talbot contra-flow boilers here described were invented by Paul A. Talbot, president of the Talbot Engineering Corporation, of New York. The Uni-flow engines here illustrated are also of his design.

General Description

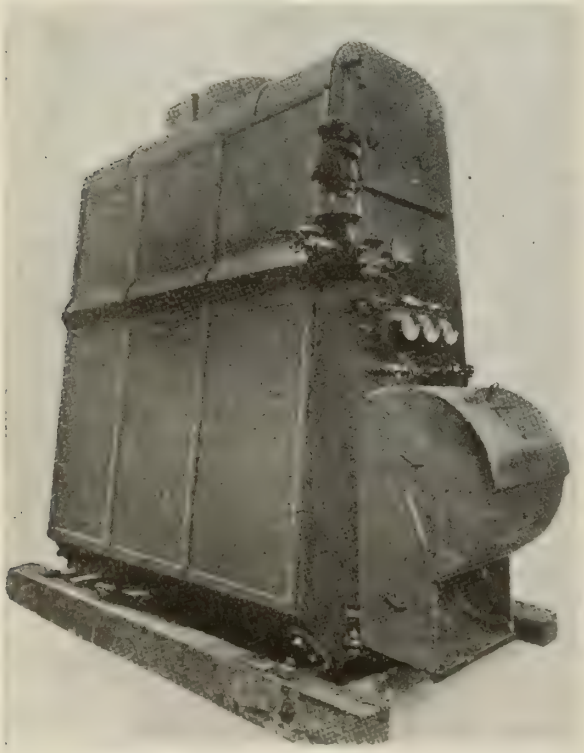
This is essentially a boiler of the contra-flow type, water entering near the stack and leaving in the form of steam near the furnace. The circulation is through water tubes and is forced at a high velocity by means of a pump, doing away with a water drum. By preventing gravity circulation, the steam is drawn directly from the lower tubes, eliminating the steam drum. The boiler is internally fired, and hence self-contained. Feed water and fuel burners are automatically controlled to adjust the boiler to widely varying demands for steam. The boiler should not be confused with "flash" boilers in which the heat-charged tubes furnish steam in direct proportion to the feed supply without regard to the control of the fire. By means of the high velocity, forced circulation and contra-flow principles, the evaporative capacity of the boiler is largely increased.

Any or all of the tubes may be readily removed and replaced without disturbing any manifolds, pipes or connections. Official tests recently carried out in the Navy Yard, New York, included a tube-renewal test of a 100 h.p. boiler. A tube was removed from the boiler under 250 lb. steam pressure and replaced by another tube in 61 seconds, the total period between the time of shutting off the fire and feed water and the time of regaining full pressure and maximum capacity of operation being 3 min. 16 sec.

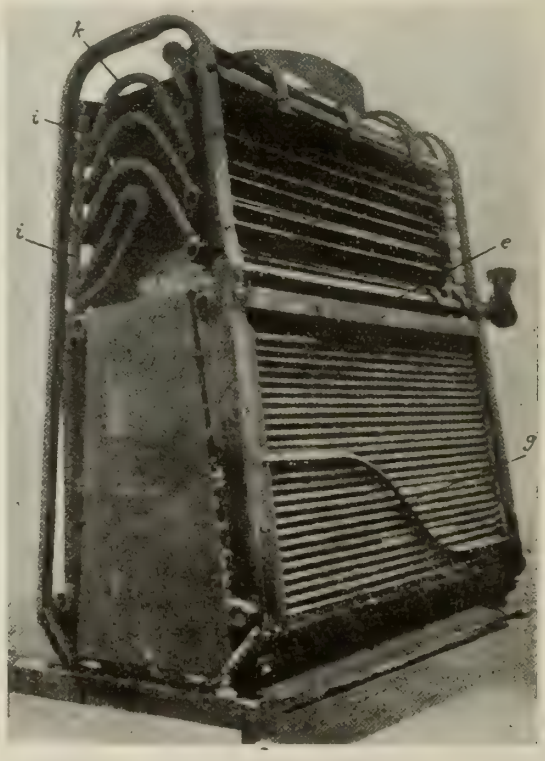
An idea of the general construction of the boiler may be obtained from Figs. 1 and 2. Fig. 1 shows the front and Fig. 2 the rear of the boiler with the casing removed. Fig. 3 shows complete boiler with its casing. The illustrations are of a boiler having an evaporation of 15,000 lb. of water per hour with ¼ in. of water draft, 20,000 lb. per hour with 1 in. draft and double the normal capacity at slightly above 2 in. draft.

The frame consists of front and rear sections, roughly resembling horseshoes in shape, fastened together at top and sides by lateral ties, and at the bottom by the ash pan and additional ties. The stack ring and upper panel work are supported by framework bent to conform to the curve of front and rear frames. For fastening the boiler in position, feet are provided which are bolted to the main frame through the ash pan. The door frame, of angle cross-section, is fastened at the top and bottom to the main frame and serves as a support for regulating valves shown in Figs. 1 and 3 and described more fully later.

The tubes throughout the boiler are

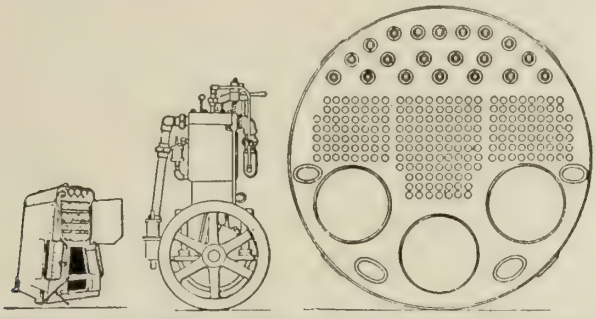


FRONT OF BOILER WITH CASING



HEAR OF BOILER CASING REMOVED

all alike. As will be seen in Fig. 4, the crucible steel header consists of two sets of overlapping compartments, into one of which is screwed the open-end field tubes, and into the other the generating tubes, there being an annular space between the two tubes. The end of each generating tube is welded together so as to close it. These closed ends are free to expand and are supported in front by perforated sheets of metal. The method



COMPARATIVE SIZE OF TALBOT BOILER, GAS UNIT AND SCOTCH MARINE BOILER OF EQUAL CAPACITY.

of fastening the tubes into the headers is shown in Fig. 5. Both tubes are threaded with double the standard taper, which makes it easy to remove them. The fit is sufficiently tight to hold a pressure of 1,000 lb. per sq. in., using standard weight pipe.

Five sets of tubes with horizontal headers are placed above the combustion space, and on each side of the combustion space is placed another set of tubes with headers arranged vertically. The rear of the furnace is closed by a wall containing water-circulating passages connecting the tubes on the sides, as show in Fig. 2.

Between each set of headers is a trap connection, shown in Fig. 2. These traps perform the important function of preventing water from draining by gravity from one header to the next below, until sufficient water is forced into the upper header. The formation of steam prevents the water from siphoning when circulation is at rest and the correct amount of water is thus maintained in each header in readiness for full capacity demands.

Accessibility. There are three doors in the front of the boiler, which, when opened, give access to the free ends of all the tubes. Any tube can be removed by applying a wrench to its end and unscrewing it from its header.

Operation

The circulation of water is maintained by a pump, delivering the feed water to the main check valve at the bottom of the door frame, from whence the water rises in a pipe and passes around the door frame to the regulator valve. The water then passes to the rear of the boiler to the uppermost set of tubes. In order to understand the circulation through the tubes, reference must be made to Fig. 4, which shows a typical header and tubes forming a single section, the path of water through it being indicated by arrows.

Having passed through the first set of field tubes and returned to the inner compartment of the header by way of the annular space in the generating tube, the water returns to the front of the boiler through a similar annular space in next set of tubes and back to outer compartment of the header by way of the inner field tubes. This process is repeated until the water has traversed to the opposite end of the header, where it passes out through a trap connection to the header immediately below. Passing from header to header, the water has a general downward direction to the set of tubes, which is on the left side of the furnace, as seen in Fig. 2. The circulation through all sections of tubes is the same.

Referring to Fig. 2 the steam or water from the set of tubes on the left to the furnace enters a rear wall which is partitioned in order to carry the water at high velocity from one side to the other until it is finally discharged, at the bottom of the right-hand corner, into the set of tubes on the right side of the combustion chamber.

During this passage the water has gradually changed to steam, and it now leaves the last set of tubes through the herringbone steam separator at the back of the boiler and enters the steam pipe, crossing at the front of the boiler where safety valve and steam nozzle are located. The separator drain passes to the front of the boiler where the valve controlling it is located.

The length of water passaged from the point of entering the boiler to the point of leaving it varies with the size of the boiler. The passage in a 1,000 h.p. boiler is 795 feet long, 668 ft. of which is through tubes. The areas through which the water flows also vary with the boiler and are restricted to increase the velocity of flow.

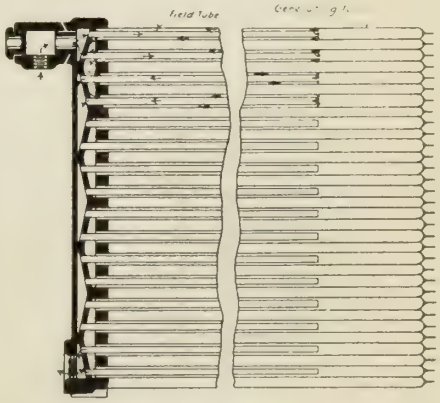
The friction of water and steam by reason of the restricted areas is about 100 lb. at normal load. This friction increases as the load increases.

The velocity through the boilers in which large tubes are used is much greater than when smaller tubes are used. Thus the velocity of the steam in the last stages of the boiler varies from 6,000 to 12,000 ft. per min. depending upon the size of the boiler tubes used. This velocity increases, of course, as steam is formed, so that the velocity in a large boiler is about 500 ft. per min. in the first and 12,000 ft. per min. in the last passages when in the form of steam.

A high rate of evaporation is obtained because of the high velocity of water through the tubes. The tubes which line the furnace evaporate as much as 30 lb. of water per sq. ft. of heating surface, while the average, including economizer and superheating surface, is 8 lb. per sq. ft. rated capacity.

The formation of scale is prevented by the high velocity and consequent scouring action of the water, which keeps the solids in constant motion. The actual velocity great enough to prevent scale is not known, but it has been determined that with a velocity as low as 60 ft. per min. and very poor water, mud forms in the economizer section of the boiler. The water tested was alkali of 27 degrees hardness, such as is found in desert regions. With a normal velocity of 500 ft. per min., such as is used, a minimum velocity of 150 ft. per min. can be maintained at partial loads. It has been found that at very low velocities the deposits have been confined to the water portion of the boiler, where the temperatures are between 100 and 150 deg. Fahr. As the entire heating surface is active and subjected to these high velocities, feed water purifiers are not necessary for this boiler.

The soot blower. The soot which forms on the economizer surface of the upper sets of tubes is blown from them by longitudinally directed steam jets situated near the ends of the tubes. Steam is supplied from the main steam pipe, and valves for the control of the jets are on the front of the boiler. The jets have proved a satisfactory method of keeping the surface relatively free from soot. The tubes at the side of the furnace are practically free from soot, and it is probable that if any soot collects on them it eventually ignites. Exterior as



DIAGRAMMATIC SECTION THROUGH HEADER AND TUBES. ARROWS SHOW COURSE OF WATER CIRCULATION.

well as interior surfaces of the boiler, therefore, are always clean, eliminating the periodic overhauling and cleaning.

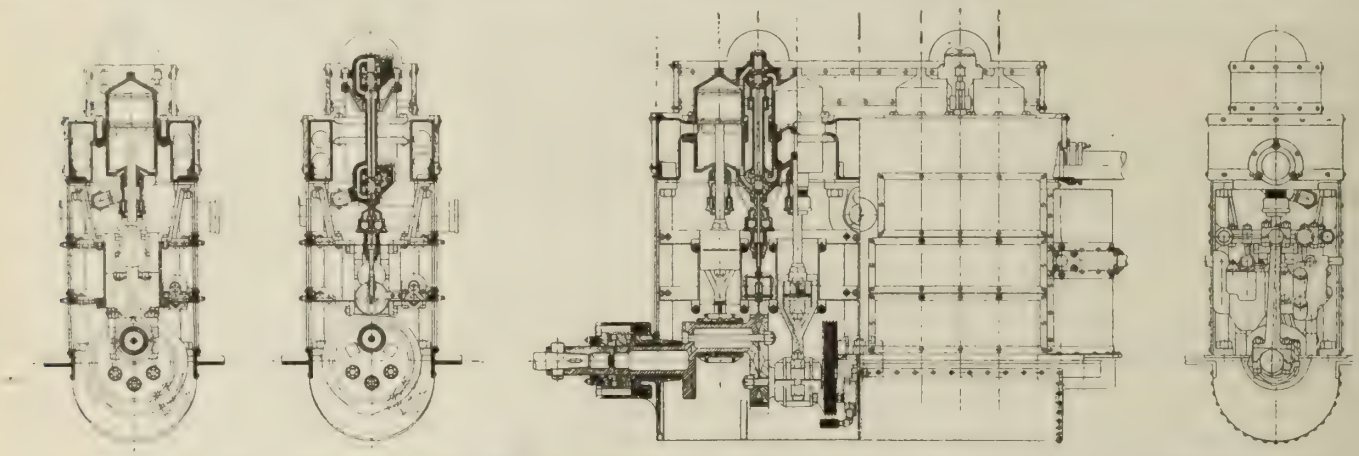
Thermostatic Control

The expansion of one of the tubes of the last set at the side of the furnace under the varying temperatures of steam contained within it is multiplied by means of levers, and is utilized as an automatic thermostatic control of both water and fuel supply. Arrangement is made so that the operator may easily and quickly adjust the thermostat to meet the demands. The slightest rise in

temperature of the outgoing steam causes sufficient expansion of the tube to open the regulating valve on the front of the boiler and admit a greater quantity of water, thus lowering the temperature of the steam. In case the operation of the thermostat has not prevented the rise in temperature, as might happen under partial load or insufficient water supply, it will cut off the supply of fuel to the furnace. At low temperatures, the supply of fuel is increased by this same thermostat.

Details of the thermostat. The expansion and contraction of the tube and the movement of the regulating valve are shown by a gauge, which is arbitrarily graduated for convenience in indicating the relative temperatures, and may be calibrated by means of a mercurial thermometer so that the operator may judge from it the temperature of the steam. Thus it might be determined that with the gauge reading 2 3-8, the temperature of the steam is 650 deg. Fahr. Having determined the point for the temperature he desires, the operator can regulate the thermostat to maintain the gauge at this point. This reading is checked occasionally, as changes in the frame, header or tube, due to wear or seasoning may make corresponding changes in the calibration of the gauge, so that some other point registers the 650 deg. which the operator is trying to maintain. This temperature gauge serves the purpose of the water column of the ordinary boil. The temperature of steam delivered tells operator whether or not the supply of water is adequate, as it is obvious that with too little water, at full capacity, the temperature of the steam will rise and indicate this condition on the gauge. Alarms may be attached, if desired, but are unnecessary, as the fire automatically is shut off before the boiler is damaged. When steam temperature drops, the normal supply of water is attained.

Hand valve. The action of the automatic valve is fairly close, but due to the fact that the regulator tube is not instantly affected there occur periodic changes in the temperature and pressure. A hand valve is provided for eliminating this action under normal loads. This valve is arranged to shut off completely the supply of water when closed, and is marked with arbitrary graduations from which the operator may determine at what point it should be set for the best results. When the hand valve is closed too much, it is obvious that the supply of water may be so limited that the temperature will rise to a point where the fuel valve will close. When the valve is opened too much, there will be a periodic variation in the temperature of the steam, due to the lag of the controlling thermostat. The point should be determined, therefore, which will allow the regulating valve to be opened all the time, preventing the periodic variation in temperature due to too frequent shutting down of the fuel valve. The accuracy of adjusting this valve determines the accuracy of temperature control under full-load conditions. Experience has shown that on a 25 per cent. load the valve does not require adjustment, but the temperature of the steam will be much less, due to an oversupply of water to a reduced fire. By readjustment of the valve the full-load temperature can be maintained at fractional loads. At less than 25 per cent. capacity a readjustment is necessary to prevent the periodic variation in temperature. The ordinary fireman can easily maintain a constant pressure and temperature by means of this hand valve.



TALBOT 4-CYLINDER UNIFLOW MARINE ENGINE. WORKING PRESSURE 500 LBS. PER SQ. IN. 1,500 I.H.P. SIZE HAS CYLINDERS 20 IN. x 20 IN. FOR 160 REVS. PER MIN. WEIGHT, 20 TONS. TWO PISTON VALVES SERVE ALL CYLINDERS. STEAM CONSUMPTION 10 LBS. PER H.P. HOUR.

Oil Burner

A steam automizer oil burner is arranged at the front of the boiler near the top of the inflow of air for combustion. The air is heated and carried in a general downward direction by the air duct, a short-metal addition to the front of the boiler having an S-shaped channel. (See Fig. 3). The quantity of the air can be adjusted by air dampers in this duct. Highly superheated steam is used to heat and vaporize the oil and to promote the velocity of the hydrocarbon mixture, which issues from the burner tips. Very heavy Mexican oil, 11 Baume, can be used in this burner. A number of burner tips shoot the flame downward into a firebrick target at the lower rear end of the furnace. This refractory target or oven is designed to distribute the heat uniformly over the entire heating surface. Temperatures of 3,800 deg. Fahr. are obtained within this oven, but as few bricks are used, the upkeep is small.

The intensity of the fire is easily controlled by increasing or decreasing the volume of steam used in automizing the oil. The flame has the effect of a large blow torch, and as the velocity is carried to an extreme, considerable noise is experienced. This is not a detracting feature in marine practice, as it is confined to the fire room.

Furnace Jacket

As heating surface surrounds the furnace on all sides, the insulation of the jacket is easily accomplished. The insulating material is applied in plastic form and fills the entire space between the sheet-metal casing and tubes themselves.

While this system is preferred, the various methods of applying insulating material in boilers having sheet-metal jackets may be used, or brick settings may be installed where space, weight and vibration are not settings for consideration.

Effect of Forcing

The thermal efficiency of this type of boiler is affected in much the same manner as in boilers of other types, although the drop in the efficiency curve is not so pronounced at higher draft pressures and higher evaporative rates, due to the fact that when forced the economizer surface in the upper part of the boiler is correspondingly increased and the stack temperatures are relatively lower. More water is introduced, and the superheating surface is reduced nearly in proportion as the load is increased.

The Talbot steam power plant is usually installed with the boiler at the side of the engine. In fact, the boiler and engine are one unit, and the plant has the advantage with other oil engine installations of occupying a minimum of space and affording a maximum of steaming radius to vessels equipped with it. The engine proper has four cylinders, which are all of equal diameter and stroke, and it is built particularly for the use of superheated steam. The piston rods and valve stems run in an oil bath

Continued on page 83

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

UPRIGHT GENERATING PLANER

THE Newton Machine Tool Works, Philadelphia, in bringing out their new upright generating planers, have vastly improved upon what were formerly known as slotting machines One of the latest of these machines is shown in the accompanying illustrations.

These rack-driven slotting machines or upright generating planers are built in sizes having 36 to 72 in. maximum stroke, and are now built for reversing planer type motor drive only.

Rapid traverse for table motions can be provided as an extra, when desired, through incorporation of suitable mechanism and use of extra constant speed motor.

The ram or cutter bar is counterweighted and has square bearings in the guides with a taper side adjusting shoe and, on all sizes, the vertical clamping surface is solid and steel faced and equipped with suitable tool-holding clamps.

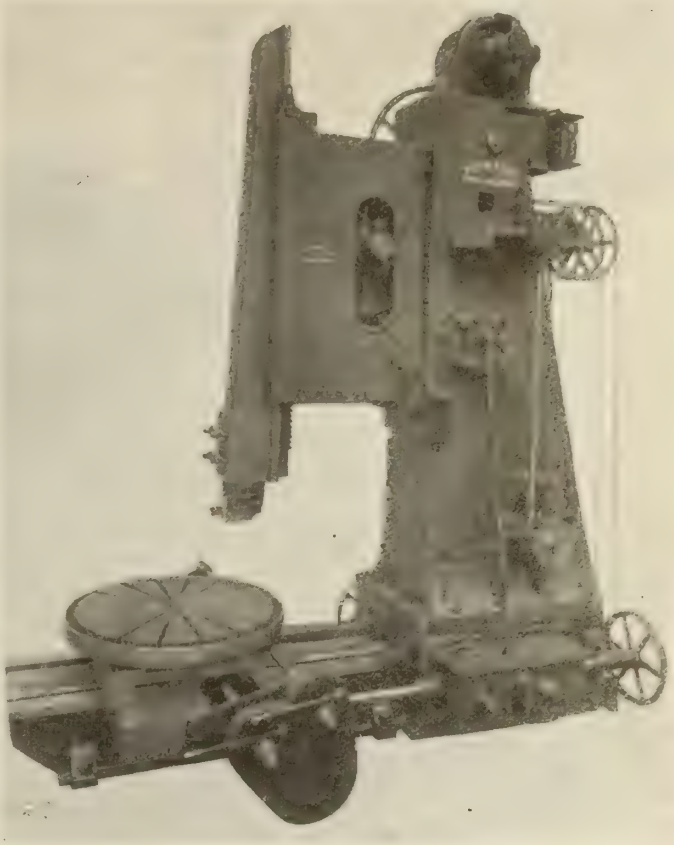
Beneath the ram or cutter bar is mounted a newly developed steel swiveling relief tool box apron, which can operate in any position of a complete circle.

Motion is transmitted from the motor to the broad face steel rack on back of the cutter-bar or ram through all steel spur reduction gears, whose coarseness of pitch and width of face increase with reduction of the gear speed.

All gears are covered and on the operating side of machines all gears are totally enclosed. Circular tables are heavily ribbed and of substantial construction and have a full bearing on the saddle, to which they are held by corner clamps. These tables are now centered by a deep face, large diameter bearing.

Oil pans are cast solid with circular tables, and are graduated on the exterior into 360 degrees.

Table saddles have narrow guide alignment control with centralized location of feed screw and taper shoe control of fit.



UPRIGHT GENERATING PLANER

Hand adjustment of the saddle is provided for from both ends of the cross slide.

All feed motions are independently clutched, and clutches have independent levers. Cross slide is of heavy box type section and has square bearings on the base, with side adjustment taper shoe. Adjustment is from operating side, as well as from front of machine.

Feed screws have bearings on each end to insure operation in tension. Particular attention is called to a newly developed sensitive stroke control disc the trips on which can be operated by hand while machines are in motion, which is desirable as drift of motors have to be compensated for.

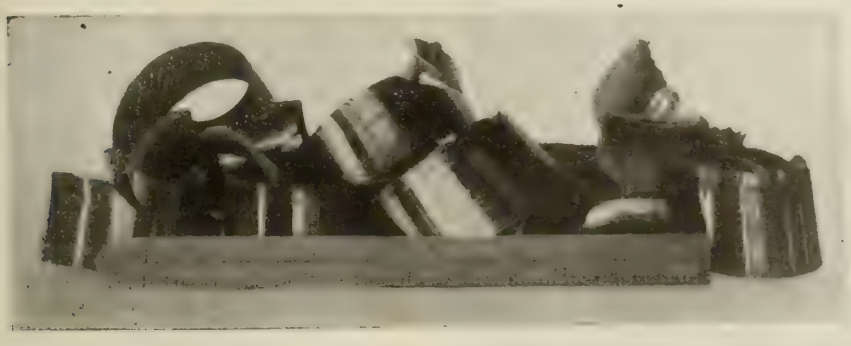
The feed motion is taken from a rocking friction box, on the outside of which the pawl rod stroke adjusting screw is located.

The circular, cross, and longitudinal feeds are variable in rate, and reversible through the use of pawl and ratchet wheel.

The cutter bar guide on the 26-in. stroke machine is cast solid with frame, and, therefore, does not have any vertical adjustment.

The cutter bar guides of the 56-in. to 72-in. machine inclusive are separate from frame and have vertical hand-controlled adjustment to permit their location in positions relative to cutter bars.

The cutter bar guide adjusting mechanism is of tandem design to prevent dropping of guide in event of accidental breakage of counterweight ropes.



SIZE OF CHIPS COMPARED TO A FOOT-RULE

PORTABLE COUNTERSINKING MACHINE

The machine described here is built by the Shipbuilders Machinery Company Inc., Seattle, Wash., and is another of

their special shipyard units.

As can be seen from the illustration, it is motor driven, and provided with long handles for guiding its movements. Instead of having to move a heavy plate to the wall radial drill, this machine can be run across the surface of the plate while on the floor. This releases men and saves space. It is handled by one man with ease, and it has a capacity of from three to four times that of the wall radial.



PORTABLE COUNTERSINKING MACHINE.

The design of the machine can be plainly seen from the cut, and the construction is rugged to suit the requirements of the work.

WONDER PIPE-BENDING MACHINE

A machine for bending wrought iron or steel pipe from four inches to six inches diameter is illustrated here. It is stated by the makers, and backed up by a sworn statement, that a 6 in. pipe can be bent cold through 90 degrees in under ten minutes. The cost of making the bend with this machine is put at $1.50 for labor, against $25.00 labor, and several hours required to do the job in the old way.

This machine should be of interest to shipbuilders, steamfitters, etc.

A copy of the deposition follows:

I, John Carragher, of Lowell, Middlesex County, Massachusetts, being first duly sworn, do on oath depose and say: That for many years I have been engaged in the machine pipe and steam fitting business, doing principally mill work, and am now engaged wth the Middlesex Machine Company of said Lowell.

I further depose and say that I was present on September 16, 1918, when the American Pipe Bending Machine Company, of Boston, Massachusetts, was engaged with their pipe bending machine bending on Powell street, in said Lowell, six-inch iron pipes. Among others present was James J. Norton, an officer of the City Iron Foundry Company, said foundry company being located in Lowell. I further depose and say that the bending of said six-inch iron pipes was done under the supervision and direction of E. P. Blake, of said Pipe Bending Machine Company.

I further depose and say, that the time consumed in bending one six-inch pipe to a ninety (90) degree bend was but nine and one-half minutes, and that the work was performed by six laborers handling the lever of said machine. I furthermore believe that the bend itself was as near perfect as could be made by any other process, either hot or cold bending.

(Signed) JOHN CARRAGHER.

Commonwealth of Massachusetts

Lowell, September 16, 1918.

Middlesex, ss.

Then personally appeared the above named John Carragher and made oath that the above statement by him subscribed is true, before me.

(Signed) WILLIAM D. REYDER.
Notary Public.



MODEL C HERCULES BENDING MACHINE.

NEW ANGLE-BEVELLING MACHINE

The bevelling machine here illustrated has been designed for shipyard use by the Shipbuilders Machinery Company Inc., Seattle, Wash.

It is arranged to be run on rails in front of the heating furnace by means of the flanged wheels. A reversing motor mounted on the machine frame itself furnishes power for the bevelling operation, current being supplied to the motor through flexible wire of suitable length.

Size of Stock

The ordinary size of bevelling machine, as made by the Shipbuilders Machinery Co. is designed for open or shut bevelling angle bars of from 3 x 3⅜ in. to 8 x 8 x ¾ in., and Z sections 6 or 8 inches broad by 4 inches depth of flange. It will also bevel angles 9 x 5 x ⅝ in., as long as the narrow flange is always the standing flange as the bar passes through the machine.

The machine opens bevels to any required degree from 9 degrees to 135 degrees, and shuts bevels from 90 degrees to 60 degrees. It draws the bar out of the furnace and does the bevelling when the bar is at its best heat. It bevels out from the heel so that the rivet head gets close up at the neck and enables the work to fay close. The bevelling is performed quickly and accurately, and makes a cleanly finished job. As the time occupied in bevelling is so short, the bar is sufficiently hot after the first pass to be turned without reheating.

The advantages over hand bevelling are considerable. It is of immense value in saving time, as the bevel of whatever limit is performed in one heat. In the hand method, considerable time is lost by the workman in getting the correct bevel. Not infrequently a second heat is necessary, and sometimes still more. The finished result is rough and requires more fairing when put into place. There is always the chance of the metal being injured in the repeated working.

All these features, it is claimed, are eliminated by the bevelling machine. It should find a welcome place in any steel shipyard.

MOTOR SHIPBUILDING

Lloyds List

Approximately 200 full-powered and auxiliary motor vessels are now under

construction in the United States, and it is of interest to note that the prices at which the contracts for these ships have been fixed are considerably lower than for corresponding craft built of steel.

At the yards of the Barnes Shipbuilding Company, Alameda, California, eight motor ships are on order, each with a deadweight carrying capacity of 4,000 tons, two of them being for the San Francisco-Hong Kong Steamship Company. At the latter port suitable oil fuel can usually be obtained at 30s. per ton, so that the cost of operation of these ships will be extremely low.

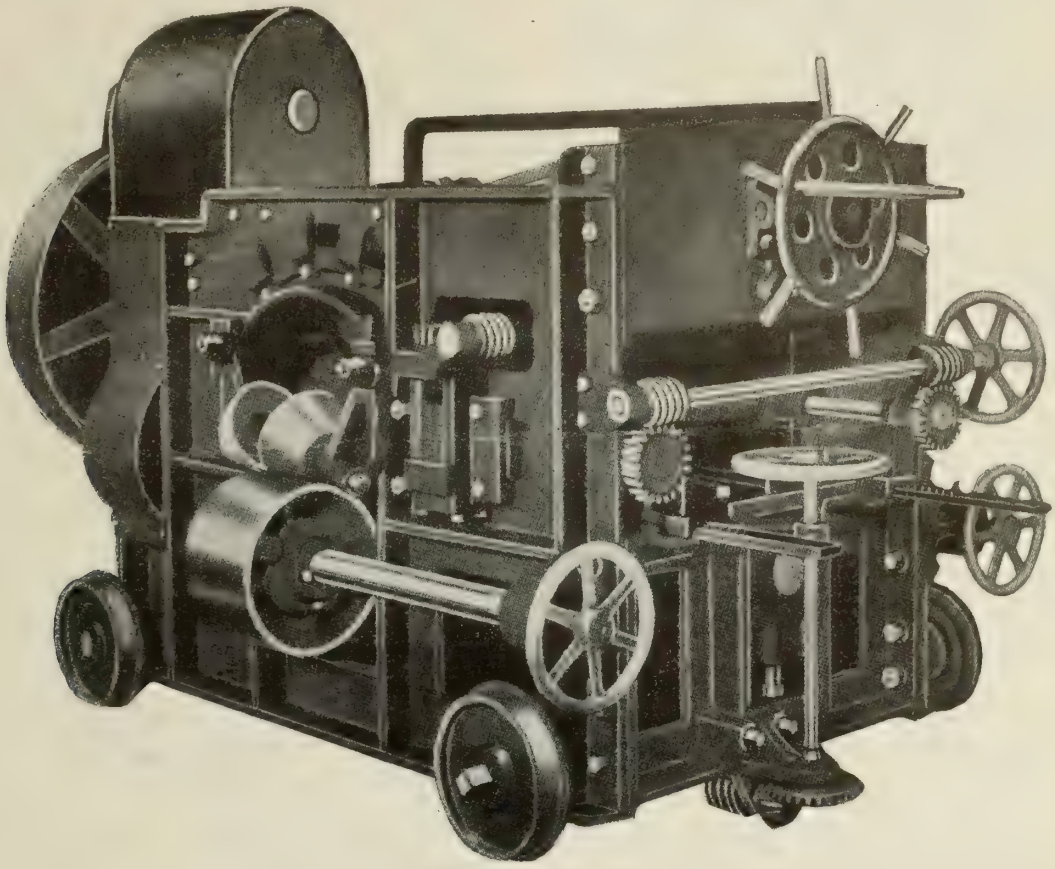
The eight vessels referred to have been contracted for at about £60,000 each, or approximately £15 per ton deadweight, which is exceptionally low according to current market rates. For instance, five steel steamers of a rather smaller size, being built in the same neighborhood, cost £100,000 each, and seven other of 7,000 tons cost £200,000 apiece.

At Seattle, the Alaska Pacific Navigation Company has five wooden motor ships on the stocks, each 261 ft. in length and of a gross tonnage of 2,350 tons. They are of exceptional interest in that, in addition to a large cargo space they have accommodation for 45 first-class, 55 second-class, and 33 third-class passengers. Diesel engines of 1,000 h.p. are to be installed, and the total cost of each of these craft is £46 000.

There are also under construction at Seattle, which has now become, perhaps, the biggest motor shipbuilding centre in the world, four wooden five-masted auxiliary schooners, two for Norwegian and two for American owners. These are all fitted with Skandia hot-bulb engines (of American manufacture) developing about 800 b.h.p. The deadweight carrying capacity is 3,500 tons, and the cost of each ship is £70,000, auxiliaries being, of course, more expensive than corresponding full-powered craft.

Another shipbuilding firm at Seattle, the Sandstrom Shipbuilding Company, is building two vessels similar to those just mentioned, at the same contract price, while at Wilmington two four-masted schooners designed by Messrs. Cox & Stevens are under construction at the yard of the Wilmington Shipbuilding and Marine Construction Corporation, each 236 ft. long with a deadweight capacity of 2 000 tons, and costing £30 000

The most interesting order that has been placed lately in America is, however, one for 40 auxiliary schooners. These are all contracted for by the Foundation Shipbuilding Company of Portland (O.), but the price fixed is not stated. Oil engines of American design are to be installed.



ANGE BEVELLING MACHINE

TALBOT BOILERS

sContinued from page 80

and packing trouble is practically eliminated by using a special form of water cooled stuffing box. No cylinder oil is used within the cylinders, and long tests covering several years have proved that the wear is even less without the use of cylinder oil than with it in engines operated on wet steam.

Engine Control

The control is effected by an oil operated piston, both the reverse mechanism of the engine and the throttle valve being operated from any position in the boat where the control station is located or from various positions if more than one control station is installed. Four small pipes carry the oil from the piston at the control station to the oil piston on the throttle valve and reverse gear on the engine. This control is effected very much easier than any gas engine control yet devised, as no manual effort is required, there being no clutches, etc. The engine itself reverses and the control mechanism is perfectly balanced so that practically no power or effort is necessary in controlling the engine. The steering gear on our latest battleships is controlled in substantially the same manner as controlling the Talbot steam power plant.

The Canadian Letters Patent and exclusive rights to manufacture, sell, install, etc., Talbot contra-flow steam boilers and Talbot uni-flow engines, have been secured by C. L. Dixon, late works manager and production engineer of the P. Lyall and Co. munition plants. Mr. Dixon is now president and general manager of the Montreal General Tool Co., which firm is now organizing to undertake the construction of this new class of power equipment.

Work in Progress in Canadian Shipyards

A Record of Work Recently Completed or in Process of Completion — Principal Features of Specification—Approximate Launching Dates—Vessels on Order

BRITISH COLUMBIA

YARROWS, LIMITED, ESQUIMALT, B.C.
One stern-wheel steamer, 165 ft. x 35 ft., for Indian Government service.
At present engaged chiefly on repair work.

H. VOLLMERS, NANAIMO, B.C.
One gasoline tug, 9 tons.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
Four wooden steamers, Nos. 10-11-12-13, for undisclosed interests. 250 ft. x 43 ft. 6 in. x 25 ft., moulded depth, 2,800 tons d. w., 1,000 h.p., single screw engines, 12 knots, naval architect, I. Alexander. Launchings March 14, April 14, May 15 and June 15, 1918.

B.C. CONSTRUCTION & ENG. CO., POPLAR ISLAND, NEW WESTMINSTER, B.C.
Four wooden vessels, 1,800 gr. tons, 2,800 tons d.w.

NEW WESTMINSTER MARINE CO., FT. OF FURNESS ST., NEW WESTMINSTER, B.C.

STAR SHIPYARD CO., NEW WESTMINSTER, B.C.

J. A. CROLL, PORT ALBERNI, B.C.

PACIFIC CONSTRUCTION CO., PORT COQUITLAM, B.C.
Taken over the plant of the Coquitlam Shipbuildiug Co.
Gasoline yacht, 50 ft., June, 1918.
Three wooden freight steamers, Nos. 20-21-22, 250 ft. b. p. x 42 ft. 6 in. x 25 ft., 1,800 gr. tons, 2,800 tons d.w., trip. exp. engines, water tube boilers ,12 knots, 1,000 h.p. Two for undisclosed interests, one for builder's account. Launchings May 20, June 15, Sept., 1918.
Four new berths under construction for steel ships up to 10,000 tons.

C. E. BAINTER, PRINCE RUPERT, B.C.
Several wooden fishing steamers, for undisclosed interests.

GRAND TRUNK DRYDOCK SHIP REPAIR CO., LTD., PRINCE RUPERT, B.C.

S. A. MOULTON, PRINCE RUPERT, B.C.
Ten composite vessels for undisclosed interests.

BRITISH-AMERICAN SHIPBUILDING & ENG. CO., VANCOUVER, B.C.
Establishing plant on Kitsilano Reserve.
Twenty wooden vessels being built for undisclosed interests, 3,500 tons each.

JOHN COUGHLAN & SONS, N. VANCOUVER, B.C.
One steel freight steamer, 427 ft. 9 in. x 54 ft. x 29 ft. 9 in., draft 24 ft. 2 in., speed 11½ knots, 5,730 gross tons. Launched Jan. 10, 1918, for B. Stolt Nielsen, Christiania, Norway. Both sold to the Cunard Line.
Three steel steamers, "War Chariot," "War Chief," and "War Noble," Nos. 4-5-6, 425 ft. x 54 ft., 8,800 tons cap., for the Cunard Line.
Six steel freight steamers, 425 ft. x 54 ft. x 24 ft. 2 in., 8,800 tons cap., 1 knots, for undisclosed interests. Delivery Jan., Feb., March, May and July, 1918.
One steel freight steamer, "Alaska," 427 ft. 9 in. x 54 ft. x 29 ft. 9 in., draft 24 ft. 2 in., speed 11½ knots, 5,730 gr. tons, 8,800 d.w. Launched Jan. 10, 1918, for B. Stolt Nielsen, Christiania, Norway. Sold to the Cunard Line.

THE FOUNDATION CO., VANCOUVER, B.C.

FRASER VALLEY SHIPBUILDING CO., VANCOUVER, B.C.

GRANT, SMITH & CO., VANCOUVER, B.C.
Six wooden cargo vessels, 250 ft. x 43 ft. 6 in. x 25 ft., 3,000 tons cap., 9½ knots, for the Canadian Government.

HARRISON & LAMOND, SHIPBUILDERS, LTD., VANCOUVER, B.C.
One wooden auxiliary schooner, 225 ft. x 44 ft. x 21 ft. 4 in., 1,600 gr. tons, 2,550 tons cap., for undisclosed interests.

LYALL SHIPBUILDING CO., NORTH VANCOUVER, B.C.
"War Puget," Feb. 16, 1918, 250 ft., wood, 2,080 tons.
Ten wooden cargo ships, for undisclosed interests. Launchings Jan. 20, Mar. 2, Mar. 23, and April 11, 1918.
Building six wooden vessels for own account.
"War Caribou," April 10, 1918, 3,080tons, wood.

W. R. MANCHION, VANCOUVER, B.C.

STANDARD SHIPBUILDING CO., VANCOUVER, B.C.
Two 3,500-ton vessels for Brazilian Govt., and six for French Govt. of 4,500 tons.
Donohoe reinforced type, wood composite construction.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
Number of small vessels being constructed at total value of $300,000.
4,500-ton floating drydock, 352 ft. long.

VANCOUVER SHIPYARD, LTD., VANCOUVER, B.C.
One motor freighter, 125 ft. x 24 ft. x 12 ft., wood, 160 h.p., Bolinder's crude oil engine. To be completed Aug., for Taylor Engr. Co.
Also repairing several steamers and schooners.

THE WALLACE SHIPYARDS, LTD., N. VANCOUVER, B.C.
"War Dog," 4,500 tons, steel, May 18, 1918.
"War Power," 4,600 tons, steel, March 23, 1918.
Two steel steamers, 315 ft. x 45 ft. x 27 ft., 4,600 tons d. w., trip. exp. vertical engines ,two S. E. Scotch boilers, 10 knots, single screw, for the Canadian Government
Two wooden aux. schooners, 255 ft. o. a., 225 ft. keel x 44 ft. x 21 ft. 4 in., five masts, 1,500 gr. tons, cap. 2,500 tons or 1,500,000 ft. lumber, two hatches, twin 160 h.p. Bolinders Hot-bulb engines, twin screws, for the Canadian Government.
Four wooden cargo vessels, aggregate tonnage of 17,500 tons for undisclosed interests.

CHOLBERG SHIPYARD, VICTORIA, B.C.
4 1,500-ton vessels for Norwegian purchasers. Keels laid Oct. 4th, 10th and 25th respectively.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
"Teco," 300 tons. Motor coasting freighter fitted with Bolinder 200 h.p. Built for William Mason Rooke.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
5 1,500-ton d.w. wooden vessels for the French Government, four of which are in frame. Planking and ceiling progressing in three.

NORTHERN CONSTRUCTION CO., VANCOUVER, B.C.
5 1,500-ton d.w. compound engines, 12 x 24 x 16 stroke, twin screw water tube boilers, 2,000 sq. feet heating surface. Building for French Government.

THE FOUNDATION CO. OF B.C., VICTORIA, B.C.
20 wooden ships for French Government, 3,000 tons d.w., fitted with triple expansion twin screw engines, 1,100 I.H.P. Contract to be completed in December.

WESTERN CANADA SHIPYARDS ,LTD., VANCOUVER, B.C.
"War Nootka," Jan. 4, 1918, 3,080 tons (machinery installed at Ogden Point Assembly Sheds).
Six wooden freight steamers, 250 ft. h.p., 259 ft. o. a., 43½ ft. extreme breadth, molded 42½ ft., 25 ft. molded depth., draft 22 ft., 2,800 tons d. w., for undisclosed interests. "War Nootka," launched January 4, 1918. "War Selkirk" launched March 6, 1918.
"War Tatla," "War Casco, "War Chilkat," "War Tanoo," 4 standard vessels now under construction.

CAMERON-GENOA MILLS CO., VANCOUVER, B.C.
"War Yukon," Jan. 24, 1918, 3,080 tons, wood (machinery installed at Ogden Point Assembling Sheds.

THE FOUNDATION CO. OF B. C., LTD., VICTORIA, B.C.
Building ships for undisclosed interests.
Five wooden steamers, 250 b. p. x 42 ft. 6 in. x 25 ft., 1,800 gr. tons, 2,800 tons d. w., one trip. exp. engine, 1,000 h.p., "Howden" water tube boilers, furnished and installed by owners, 10 knots, for undisclosed interests. Esplen & Son & McNaught, N.Y.C., designers.
No. 1—"War Sonchee," launched Dec. 27, 1917.
No. 2—"War Masset," launched April 11, 1918.

CLARENCE HOARD, VICTORIA, B.C.
Wooden car barge for C.P.R., Jan., 1918

VICTORIA SHIPBUILDING CO., VICTORIA, B.C.
Constructing wooden ships for British Govt., 3,500 tons each.

NEW BRUNSWICK

C. T. WHITE & SON, LTD., ALMA, N.B. (Office at Sussex, N.B., also.)
Two schooners aux. power, 143 ft., 900 tons d. w., first to be launched in April; second in June.

JAMES X, LENTEIGNE, LOWER CARAQUET, N.B.
One schooner, 28 tons, wood.

INTERNATIONAL SHIPBUILDING CO., NEWCASTLE, N.B.
Two four-masted wooden auxiliary schooners, 155 ft. keel, 37 ft. depth, 535 net tons. One completed in September and the other December, 1918. For builders' account.

EUREKA SHIPBUILDING CO., NORTH HEAD, N.B.
One wooden schooner, "Mollie & Melba," 350 tons reg.

PORT COLBORNE BUILDING & REALTY CO., LTD., REXTON, N.B. (Head Office, Welland, Ont.)
Four-masted wooden schooner. Has cap. of 3 schooners per year

GRANT & HORNE, ST. JOHN, N.B.
Two wooden cargo steamers, "War Fundy" (launched Aug., 1918) and "War Digby," 250 ft. x 42 ft. 5 in. x 25 ft. 5 in., 1,000 h.p., speed 9½ knots, 2,800 tons d.w., for undisclosed interests.

MARINE CONSTRUCTION CO., CANADA, LTD., ST. JOHN, N.B.
Four wooden auxiliary, four-masted schooners, 185 ft. o. a., 165 ft. keel x 40 ft., 1,100 d. w. tons, for builder's account. J. Murray Watts, Philadelphia, naval architect. Launched April, 1918.
One wooden schooner, "Dorfontein," 740 reg. tons. Launched June, 1918.

ST. JOHN SHIPBUILDING CO., ST. JOHN, N.B. (Plant at Courtenay Bay.)
Ten five-masted auxl. schooners, oil burning engines, for undisclosed interests.
Established plant for steel and wood construction.

ST. MARTIN'S SHIPBUILDING CO., ST. MARTIN'S, N.B.
One wooden schooner, 450 tons, three masts. Launched in July for builder's account.

PETER & A. A. McINTYRE, ST. JOHN, N.B.
One 900-ton schooner under construction.

NEWFOUNDLAND

ANGLO-NEWFOUNDLAND DEVELOPMENT CO., BOTWOOD, NFLD.
Two three-mast aux. schrs., wood, 450 tons, 150 H.P. for the builders' account.

NEWFOUNDLAND SHIPBUILDING CO., HARBOR GRACE, NFLD.
To build ships of 1,200 tons d.w. Steel ships later.

M. E. MARTIN, MORRIS ARM, NR. ST. JOHN'S, NFLD.
Two wooden schooners, 300 tons each, for builder's account.
One wooden schooner, 500 tons, for builder's account.

UNION SHIPBUILDING CO., ST. JOHN, NFLD.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL, N.S.
"Hilda M. Clark," March 4, 1918, 187 ft., 640 tons reg.
Two schooners, three-masted, wood 500 tons, 170 ft. long. Completed August and December, 1918.

NOVA SCOTIA

B. L. TUCKER, BASS RIVER, N.S.
One schooner, 350 tons, wood.

JAS. S. CREELMAN, BASS RIVER, N.S.
One three-masted schooner, wood, 170 ft. long, 500 tons. Completed October, 1918, for builders' account.

HANKINSON SHIPBUILDING CO., BELLIVEAU'S COVE, N.S.
One schooner, 360 tons, wood.

ELI PUBLICOVER, BLANDFORD, N.S.

BRIDGEWATER SHIPPING Co., BRIDGEWATER, N.S.
One tern schooner, 450 tons gr., wood. Adapted for aux. power. Completed Sept., 1918.
One tern schooner, 275 tons gr., wood. Adapted for aux. power. Completed Nov., 1918.
Both built on owner's account and for sale.

W. A. NAUGLER, BRIDGEWATER, N.S.
One wooden three-masted schooner, "Wm. A. Naugler," 146 ft. o. a., 116 ft. keel x 32 ft. x 11 ft. 6 in., 360 gr. tons, 600 tons cap., for builder's account.
One schooner, 300 tons, wood.

H. MAC ALONEY, CANNING, N.S.
Two wooden schooners, 400 tons each. For builder's account. Launched July and October, 1918.

S. M. FIELDS, CAPE D'OR, N.S.
One three-masted schooner, 350 tons.
Keel laid for another three-master.

CHESTER BASIN SHIPBUILDERS, LTD., CHESTER BASIN, N.S.
Two schooners, 100 tons, wood. Launched Aug., 1917, Dec., 1917.
One four-masted schooner, 60 tons. Launched Sept., 1918.
One two-masted schooner, 100 tons. Launched June, 1918.

MORTIMER PARSONS, CHEVERIE, N.S.
One wooden three-masted schooner, 170 ft. x 38 ft. x 14 ft., 575 gr. tons, 900 tons cap., for builder's account. Launched Sept., 1918.
Two wooden three-masted schooners for builder's account.
One tern schooner, "Donald Parsons," 140 ft. keel x 34 ft. 4 in. x 12 ft. 4 in., 500 gross tons, 825 tons d.w. for Mortimer Parsons. Launched May 11, 1918.
Another vessel, same size. Launched Nov., 1918, for builder's account.

BAY SHORE SHIPYARD, CHURCH POINT, N.S.
Building two wooden vessels for R. C. Elkin, Ltd., St. John, N.B.

MOISE BELLIVEAU, CHURCH POINT, N.S.
One schooner, 450 tons, wood.

FIDELE BOUDREAU, CHURCH POINT, N.S.
One schooner, 350 tons, wood.

J. E. GASKILL, CHURCH POINT, N.S.
Other yards at Grosses Coques, Little Brook, Meteghan and Port Wade, N.S.
Five wooden schooners from 344 to 387 reg. tons. All sister ships.

COMEAU SHIPBUILDING CO., COMEAUVILLE, N.S.
One three-masted wooden schooner, for builder's account, 450 tons.

J. W. COMEAU, COMEAUVILLE, N.S.
One schooner, 329 tons, Jan., 1918.

J. N. RAFUSE & SONS, CONQUERALL BANKS, DIGBY CO., N.S.
(Other plants at Salmon River and Shelburne, N.S.)
Two wooden three-masted schooners, 120 ft. x 32 ft. x 12 ft., 700 tons cap., for builder's account. For the market. Launched Oct., 1917, and Jan., 1918.
One three-masted wooden schooner, "Integra," 112 ft. x 30 ft. x 11 ft. 6 in., 600 tons cap., for J. O. Williams & Co., St. John's, Newfoundland. Launched Nov. 25, 1917.

E. F. WILLIAMS, DARMOUTH, N.S.
One schooner, 360 tons, wood.

ROBAR BROTHERS, DAYSPRING, N.S.
Schooner for Capt. Ivan Creaser, Dayspring.

MAURICE E. LEARY, DAYSPRING, N.S.
One wooden schooner, 225 tons, 135 ft. o. a. Launched Aug., 1918, for La Have Outfitting Co., La Have, N.S.

J. NEWTON PUGSLEY & CHAS. ROBERTSON, DILIGENT RIVER, N.S.
One schooner, three-masted, 475 tons.

McLEAN & McKAY, ECONOMY, N.S.
One tern schooner, wood, 400 tons net, 135 ft. keel. Launched Sept. 1, 1918, for builders' account.

S. J. SOLEY, ROX RIVER, N.S.
One schooner, three-masted, 121 ft. keel, 300 tons. Built of native wood. Launched Sept., 1918. For builder's account. For sale.

ALLAN & FRASER, FRASERVILLE, N.S.
One schooner, 350 tons, wood.

BERNARD W. MELANSON, GILBERT'S COVE, N.S.
One three-masted schooner, wood, 250 tons net. Completed November, 1918, for builder's account.

AMOS BLINN, GROSSES COQUES, N.S.
One schooner, 375 tons. Jan., 1918.
One schooner, 350 tons, wood.

BINN BROS., GROSSES COQUES, N.S.

F. K. WARREN & CO., GROSSES COQUES, N.S. (Offices in Union Bank Chambers, Halifax, N.S., also.)
350-ton tern schooner, under construction Jan., 1918.

HALIFAX SHIPBUILDING CO., HALIFAX, N.S.

J. WILLARD SMITH, HILLSBURN, N.S. (Head Office, St. John, N.B.)
One tern schooner, wood, 140 ft. keel, 35 ft. beam, 450 tons net reg tons.

J. W. RAYMOND, LITTLE BROOK, N.S.
Building 500-ton wooden schooners for local owners.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S.
One 800-ton vessel for undisclosed interests. Launch about Dec. 24.

CONRAD & REINHARDT, LUNENBURG, N.S.
"Excellent," 600-ton, launch in January next. Also 175-ton schooner.

J. WILLARD SMITH, HILLSBURN, N.S.
Wooden three-masted schooner. Launch in April, 1919.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
750-ton auxiliary schooner. Completed in January, 1919.

OSMOND O'BRIEN & CO., NOEL, N.S.
"J. Miller." 700 tons. Keel laid April 18. Launched Nov. 20. Completed Nov. 27.

BERNARD & MELANSON, GILBERT'S COVE, N.S.
550-ton vessel for owner's account. Completed Nov. 25.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL
"Mapleland," 1000-ton schooner, fitted with twin Fairbanks-Morse oil engines, 200 horsepower. Complete about Dec. 10. For builder's account.

L. S. CANNING, WARD'S BROOK, N.S.
"W. C. Smith," 700 tons. Completed Dec. 18.

McLEAN & McKAY, ECONOMY, N.S.
"Truro Queen," 750 tons, 15 h.p. engine for hoisting sails and anchor. Completed.

HENRY COVEY, INDIAN HARBOR, N.S.

CHARLES GRIFFIN, ISAACS HARBOR, N.S.
One schooner, 40 tons, wood.

LEWIS SHIPBUILDING CO., LEWISTON, N.S.
One schooner, 670 tons. Jan., 1918.

INNOCENT COMEAU, LITTLE BROOK, N.S.
One three-masted schoner, 140 ft. x 35 ft. 6 in. x 17 ft. 6 in., 650 gr. tons, for the Weymouth Shipping Co., Weymouth, N.S., Can. Delivered Jan. 18, 1918.

J. W. RAYMOND, LITTLE BROOK, N.S.
One wooden schooner, No. 4, 140 ft. x 36 ft. x 17 ft., 575 gr. tons, for Jones Bros., Weymouth, Digby Co., N.S.

H. A. FRANK, LIVERPOOL, N.S.
Two wooden schooners, 500 tons, for builder's account.

McKEAN SHIPBUILDING CO., LIVERPOOL, N.S.
One wooden three-masted schooner, 126 ft. keel x 3 ft. x 12 ft. 9 in., 700 tons d.w., for builder's account. Launched May, 1918.

W. F. McKEAN & CO., LIVERPOOL, N.S.
One schooner 400 tons, Jan., 1918.

D. C. MULHALL, LIVERPOOL, N.S.
Two wooden schooners, one 300 gross tons, other 400 gross tons, for undisclosed interests.

ROBIN, JONES & WHITMAN, LIVERPOOL, N.S.
One schooner, 340 tons, wood.

SOUTHERN SALVAGE CO., LIVERPOOL, N.S.
One wooden schooner, three masts, 300 gross tons, 600 tons capacity, for a West Indian firm. Launched Jan., 1918.
One wooden steamer, No. 5, 250 ft. x 43 ft. 6 in. x 25 ft., 2,900 gr. tons, 10 knots, 1,000 h.p., for undisclosed interests.
One two-masted schooner, "Win-the-War," 137 ft. o. a. x 25 ft. 2 in. x 11 ft. 6 in. ,187 gr. tons, for the builder's account. Launched Nov., 1917.

CONRAD & REINHARDT, LUNENBURG, N.S.

LUNENBURG MARINE RAILWAY, LUNENBURG, N.S.

FRED A. ROBAR, LUNENBURG, N.S.

J. B. YOUNG, LUNENBURG, N.S.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
One two-masted schooner, 120 ft. o. a. x 25 ft. 6 in. x 10 ft. 6 in., 200 tons d.w., for Lunenburg Outfitting Co. April, 1918. Christened "Madeline Adams."
One three-masted schooner 125 ft. keel x 32 ft. x 12 ft., 600 tons, d. w. To be delivered July, 1918.
Two masted schooner, "Agnes D, McGlaston," 130 ft. x 26 ft. 8 in. x 10 ft. 8 in. Launched Nov. 13, 1917.
Keel laid for three-masted wooden schooner, 200 tons.

J. ERNEST & SON, MAHONE BAY, N.S.
One schooner, 520 tons. Jan., 1918.

O. A. HAM, MAHONE BAY, N.S.
One schooner, "Dozle," 128 tons. Launching May 30. One motor boat about 20 tons.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S. (Leased to Montague Mahaffy, Toronto.)
One three-masted schooner, 325 tons gr. reg., 500 tons cap., West Indies freight type. Launched July.
Keel laid for another three-masted schooner with cargo capacity of 425 tons.

JOHN McLEAN & SONS, MAHONE BAY, N.S.
One schooner, 95 tons, wood.

J. A. BALSOM CO., LTD., MARGARETSVILLE, N.S.
One schooner, 409 tons. Jan., 1918.

CLARE SHIPBUILDING CO., METEGHAN RIVER, N.S.
One wooden schooner for builder's account. 400 tons.

A. H. COMEAU & CO., METEGHAN, N.S.
One schooner, 400 tons, wood.

AGAPIT COMEAU, METEGHAN, N.S.

JOHN F. DEVEAU, METEGHAN, N.S.
A 300-ton schooner was launched recently for Ritcey & Co., Lunenburg, N.S., and named Charles A. Ritcey.
1 schooner, 425 tons. Jan., 1918.
1 schooner, 400 tons, wood.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
One wooden sailing schooner, 800 tons d.w. Keel laid April 15th, 1918, to be launched December 17th and completed December 31st. Built for sale.

J. E. GASKILL, CHURCH POINT, N.S.
One wooden schooner, 750 tons d.w. Keel laid March, 1918, to be launched December 15th. Built for J. E. Corkill.

THERIAULT SHIPBUILDING CO.
One wooden vessel, 500 tons d.w. Keel laid September 18th, to be launched in May, 1919. Built for owners account.

SIDNEY ST. C. JONES, WEYMOUTH, N.S.
One tern schooner, "Westway," 450 tons d.w. Keel laid April 18, to be launcheed December 30, 1918, and completed in January, 1919. Built for sale. 130 feet by 28 feet 8 inches beam by 10 feet 6 inches deep.

THE HANKINSON SHIPPING CO., BELLEVEAU'S COVE, N.S.
One vessel, 750 tons d.w. "Charles Doucet," fitted for auxiliary engine. Keel laid April 1, to be launched December 17. One vessel 750 tons d.w. Keel laid Aug., 1918, to be launched April, 1919, and completed. Built for owners account.

FAUQUIER & PORTER, HANTSPORT, N.S.
One vessel 1,800 tons d.w. to be fiitted with two 100 h.p. crude oil engines (Canadian Fairbanks-Morse). Launched December, 1918, and completed January, 1919. Built for sale. Propose to lay keels for two 500-ton, 3-mast schooners as soon as this schooner is launched.

N.S. SHIPBUILDING & TRANSPORTATION CO., LIVERPOOL, N.S.

"Protea," 400 tons d.w., three-masted schooner with provision for Morse semi-Diesel engines. Keel laid Nov. 18. To be completed May account and sold to Pearson & Walker, Cape Town, S.A.

"Gordon T. Tibbs," 400 tons d.w., three-masted schooner. Keel laid Aug. 30. To be launched Dec. 15 and completed Jan. 19. Built for builder's account and sold to G. Tibbs & Sons, St. John's, Nfld.

One beam trawler, 900 tons d.w., 400 i.h.p., with two 200 Fairbanks-Morse semi-Diesel engines. Keel laid Nov. 19. To be completed May next. Built for Rafuse Grey et al Le Havre. Repairing schooner Karmoe for N.Y. owners.

H. ELDERKIN & CO., PORT GREVILLE, N.S.

Two vessels, 825 and 500 tons respectively. Keel laid April and August. To be launched December and January. Built for builder's account.

J. E. GASKILL, METEGHAN, N.S.

THOMAS GERMAN, METEGHAN, N.S.

One schooner, 350 tons, wood.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S. (Leased James Cosman's shipyards.)

Building several wooden schooners for own account.

DR. F. H. MACDONALD, METEGHAN, N.S.

One wooden four-masted schooner, "Rebecca L. Macdonald," 201 ft. o. a. x 6 ft. x 16 ft., 800 gr. tons, 1,500 tons d.w., for builder's account. Launching January 1, 1918.

One wooden fishing schooner, No. 3, 84 ft. x 17 ft. x 7 ft., 50 gr. tons, 5 h.p. Launched August, 1918.

One schooner, 544 tons, wood.

METEGHAN RAILWAY & SHIPBUILDING CO., METEGHAN, N.S.

One wooden three-masted schooner, 182 ft. x 35 ft., 450 gr. tons.
One schooner, 470 tons, wood.

CHAS. McNEIL, NEW GLASGOW, N.S.

One wooden 3-masted schooner, 103 ft. x 30 ft. x 10 ft. 9 in., 200 tons, for builder's account. Launched July, 1918.

One wooden 3-masted schooner, 142 ft. x 25 ft. 4 in. x 13 ft., 500 gr. tons, for builder's account. Launched Oct., 1918.

THE NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

Two steel freight steamers, 257 ft. 9 in. x 35 ft. x 20 ft., 1,700 gr. tons. 2 350 tons cap., trip. exp. engines, boilers 10 ft. 6 in. x 11 ft. 6 in., 800 h.p., 8.5 knots, for undisclosed interests.

Two steel cargo strs. Raised quarter deck type, 248 ft. 9 in. long, 1,649.68 gross tons. Triple expansion engines, 17, 28, 46 x 33 in. stroke. One, the "War Bee," for undisclosed interests to be completed June, 1918. Other for Steel Co., to be completed Oct., 1918.

Two masted schooner, launched May 16, 130 ft. o. a. x 26 ft. x 10 ft. 6 in. Designed by J. S. Gardner.

O'BRIEN BROS., NOEL, N.S.

One schooner, 325 tons, wood.

W. R. HUNTLEY & SON, PARRSBORO, N.S.

One wooden schooner, 175 ft. x 39 ft. x 17 ft., 900 gross tons, for

C. T. WHITE & SON, SUSSEX, N.S.

Two schooners, 325 tons each. Jan., 1918.
One schooner, 490 tons, wood.
One schooner, 850 tons, four masted.

WAGSTAFF & HATFIELD, PARRSBORO, N.S.

One schooner, 400 tons. Jan., 1918.

S. SALTER, PARRSBORO, N.S.

One 200-ton schooner, wood.

DOWLING & STODDART, PORT CLYDE, N.S.

One gas boat, 27 tons, wood.
One schooner, 300 tons, wood.

SWIME BROS., PORT CLYDE, N.S.

Several small motor trawlers, for builder's account.

G. M. COCHRANE, PORT GREVILLE, N.S.

One tern schooner, "Alfredock Hedley," 152 ft. 6 in. x 36 ft. 12 ft. 6 in., 461 tons reg., for Adam B. Mackay, of Hamilton, Ont. Launched Jan., 1918.

One 4-masted schooner, 850 tons, 155 ft. x 37 ft. x 18 ft., 2 decks, wood. To be completed Oct., 1918, for builder's account.

ELLIOTT GRAHAM, PORT GREVILLE, N.S.

Is building a schooner, "Khaki Lad," of about 325 tons, at Port Greville, N.S., for J. W. Kirkpatrick and others. She will be launched early in October, and is reported to have been sold to Newfoundland parties.

One schooner, 360 tons. Jan., 1918.

SMITH CANNING CO., PORT GREVILLE, N.S.

One schooner, 350 tons, wood.

WAGSTAFF & HATFIELD, PORT GREVILLE, N.S.

One schooner, 400 tons, wood.

WILLIAM CROWELL, PORT LATOUR, N.S.

J. W. RAYMOND, PORT MAITLAND, N.S.

One schooner, 375 tons. Jan., 1918.

PORT WADE SHIPBUILDING CO., PORT WADE, N.S. (Head Office, Digby.)

One 350-ton schooner, wood.

JOHN BROWN, PUBLIC LANDING, N.S.

One tow barge, 50 tons, wood.

THE CUMBERLAND SHIPBUILDING CO., PUGWASH, N.S.

Establishing plant for the construction of wooden ships.

MACKENZIE SHIPPING CO., RIVER JOHN, N.S.

One four-masted schooner, 600 tons, wood. About half built. Fitted for aux. engines.

CHARLES McLELLAN, RIVER JOHN, N.S.

One schooner, 100 tons, wood.

W. J. FOLEY, SALMON RIVER, N.S.

Building for J. N. Rafuse & Sons one wooden, 300 tons, under construction. Cap. of plant, 1,000 tons yearly.

J. N. RAFUSE & SONS, SALMON RIVER, N.S. (Other plants at Shelburne and Conquerall Banks.)

Launched recently a three-masted schooner named "Industrial," at W. J. Foley's ship yard at Salmon River, N.S., of the following dimensions: length, 113 ft, breadth, 30 ft., depth, 11½ ft., 325 tons.

ACADIAN SHIPPING CO., SAULNIERVILLE, N.S.

One schooner, 00 tons, wood.

SAULNIERVILLE SHIPBUILDING CO., LTD., SAULNIERVILLE, N.S.

J. LEWIS & SONS, SHEET HARBOR, N.S.

One schooner, wood, four-masted, 725 gr. tons. To be completed Sept.. 1918. For private account.

GEO. A. COX, SHELBURNE, N.S.

One schooner, 200 tons, wood.
One schooner, 322 tons, wood.

JOSEPH McGILL SHIPBUILDING & TRANSPORTATION CO., SHELBURNE, N.S.

"Sparkling Glance," 246 tons register, for Harvey & Co., St. John's, Nfld.

One schooner, 160 tons, wood.

W. C. McKAY & SON, SHELBURNE, N.S.

One wooden schooner, 130 ft. o. a. x 26½ ft. x 11 ft. depth of hold, 140 tons register. Launched Dec. 1, 1917.

One three-masted schooner, for Messrs. Hallet, of Newfoundland.
One schooner, 620 tons, wood.

J. N. RAFUSE & SONS, SHELBURNE, N.S. (Other plants at Salmon River and Conquerall Banks.)

One wooden three-masted schooner, 120 ft. x 32 ft. x 12 ft., 700 tons cap., for builder's account. For the market. Launching Jan. 10, 1918.

One wooden three-masted schooner, 118 ft. x 33 ft. x 12 ft., 700 tons cap., for builder's account. For the market. Launching Jan. 15, 1918.

Two three-masted wooden schooners, 122 ft. 6 in. keel x 32 ft. x 12 ft., 275 net tons, for J. O. Williams & Co., St. John's, Newfoundland. One to be built at Salmon River yard and one at Ship Harbor.

THE SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.

One tern schooner, "Misty Star," 145 ft. x 31 ft. x 11 ft. 6 in., 600 tons d.w., 330 tons gross, for Harvey & Co., St. John's, Newfoundland. Launching Mar. 15, 1918.

One tern schooner, 154 ft. x 32 ft. x 12 ft. 4 in., 400 gr. tons, 700 tons d.w. cap. Launching June, 1918. Not sold yet.

Two schooners, one 349 tons, other 400 tons.

EASTERN SHIPBUILDING CO., SHIP HARBOR, N.S.

One wooden schooner, 600 tons d.w., for J. N. Rafuse & Sons., Halifax, N.S., Can.

One wooden schooner, 300 tons.

STEPHEN MORASH & CO., SHIP HARBOR, N.S.

One wooden schooner, 150 ft. x 37 ft. x 13 ft., four masts, for Canadian interests. Keel laid Feb. 5, 1917.

JAMES E. PETTIS, SPENCER'S ISLAND, N.S.

One schooner, 425 tons, wood, three-masted.

CAPE BRETON SHIPBUILDING CO., SYDNEY, N.S.

THE TUSKET SHIPBUILDING CO., TUSKET, N.S.

AMOS H. STEVENS, TANCOOK, N.S.

ALVIN STEVENS, TANCOOK, N.S.

STANLEY MASON, TANCOOK, N.S.

ALBERT PARSONS, WALTON, N.S.

One schooner, 400 tons. Jan., 1918.

H. T. LeBLANC, WEDGEPORT. N.S.

One steam trawler, 165 ft., 600 tons, for J. N. Rafuse & Sons.

L. S. CANNING, WARDS BROOK, N.S.

One tern schooner, 350 tons, for W. C. Smith & Co., Lunenburg, N.S

WEDGEPORT NAVIGATION & TRANSPORTATION CO., WEDGEPORT, N.S.

T. K. BENTLEY, WEST ADVOCATE, N.S.

One 200-ton steamer.

One 4-masted schooner, wood, 511 tons. To be launched September or October. For owner's account.

J. W. KIRKPATRICK, WEST ADVOCATE, N.S.

One 350-ton schooner, wood.

BOEHNER BROS., WEST LA HAVE, N.S.

Two large fishing schooners, 150 tons each.
One beam trawler, 300 tons, crude oil engines. For local interests.

BEAZLEY BROS., WEYMOUTH, N.S. (Head Office Roy Bldg., Halifax.)

One schooner, 394 tons, three masts.

E. R. GAUDET, WEYMOUTH, N.S.

One 350-ton schooner, three-masted.

E. P. RICE, WEYMOUTH, N.S.

One three-masted schooner, 350 tons.

RICE, WARREN & CO., WEYMOUTH, N.S.

One three-masted schooner, 334 tons.

FALMOUTH SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

One wooden schooner, 350 gr. tons, 700 tons cap., for undisclosed interests.

NOEL SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

One wooden schooner, three masts, 138 ft. x 35 ft. x 13 ft., 450 net reg. tons. Oil auxiliary engines. Launching August, 1918, for builder's account.

C. A. NICKERSON, WOODS HARBOR, N.S.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
Taken over and enlarging old plant of James Jenkins.
350-ton schooner building.

W. O. SWEENY, YARMOUTH, N.S.
100-ton fishing schooner.

YARMOUTH SHIPBUILDING CO., YARMOUTH, N.S.
One 450-ton wooden schooner, 128 ft. keel. To be completed Oct., 1918.

ONTARIO

CAN. ALLIS-CHALMERS (Head Office, Toronto), BRIDGEBURG, ONT.
Six standard freight steamers, 3,500 tons, 261 feet long, for undisclosed interests.

COLLINGWOOD SHIPBUILDING COMPANY, COLLINGWOOD, ONT.
"Canadian Warrior" completed. Three steel steamers on berths.

R. MORRILL, COLLINGWOOD, ONT.
"Windsor," Aug. 10, steam tug, 105 ft., for Ontario Gravel & Freighting Co.

CANADIAN CAR & FOUNDRY CO., FORT WILLIAM.
No present contracts.

GREAT LAKES DREDGING CO., FORT WILLIAM.
No present contracts.

THUNDER BAY CONTRACTING CO., FORT WILLIAM, ONT.
One wooden freight steamer, 261 ft. long, for undisclosed interests.

NATIONAL SHIPBUILDING COMPANY, GODERICH.
Building marine engines and boilers.

KINGSTON SHIPBUILDING CO., KINGSTON, ONT.
Several steel trawlers for undisclosed interests. First one launched Dec. 22, 1917.

DAVIS DRY DOCK CO., KINGSTON, ONT.
Building steel lifeboats.

SELBY & YOULDSON, KINGSTON.

GEORGIAN BAY SHIPBUILDING & WRECKING CO., MIDLAND.
Repairing several wooden tugs.

MIDLAND SHIPBUILDING CO., MIDLAND, ONT.
Two steel steamers for Imperial Munitions Board.

MIDLAND DRY DOCK CO., MIDLAND, ONT.
Three steel freight steamers, 261 ft. x 43 ft. 6 in. x 23 ft., 3,400 tons d. w., 10 knots, for undisclosed interests. Deliveries, one in July, 1918, and two others before close of navigation, 1918.
Alterations on steamers "Mariska" and "Glenlyon."
"Western Star" being reconstructed.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONT.
Building six ships for the Canadian Government and six trawlers.

MUIR BROS.' DRYDOCK, PORT DALHOUSIE.
Repairing the wooden freight steamer "Windsor."

J. W. GEROW, ROSSPORT, ONT.

REID WRECKING CO., SARNIA, ONT.
One steel tug, 157 ft. x 32 ft. x 19 ft., trip. exp. engines, for lake or ocean service. Keel blocks laid March 5. Launching July, 1918. For Reid Wrecking Co.
"Tento," Oct. 22, 1917, 261 ft., 3,500 tons d.w. steel. For Norwegian interests. Transferred to British registry.

DOMINION SHIPBUILDING CO., TORONTO, ONT.
Building six steel steamers, 3,500 tons, for undisclosed interests.

POLSON IRON WORKS, TORONTO, ONT.
"War Timiskaming" launching in February. Three steel steamers on stocks. "War Hamilton" completed and ready for sea.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONTARIO
"War Fiend," 3,500 tons d.w., triple expansion engines, 1,800 h.p. Scotch boilers. Launched Oct. 24, 1918. To be completed Nov. Built for the Imperial Munitions Board.
"War Karma," 3,400 tons deadweight. Built for the Imperial Munitions Board. Launched October 26. Will be completed last week of Nov. Triple expansion engines, 20½ by 34 by 56 by 40-inch stroke. 2 Scotch boilers, 15 feet by 11 feet, working pressure 190 lbs. per sq. inch.

TORONTO SHIPBUILDING CO., LTD., TORONTO, ONT. (Toronto Dry Dock Co., Ltd., under same management.)
Two wooden cargo steamers, 250 ft. B.P. 42 ft. 6 in., moulded breadth 25 ft., moulded depth 22 ft., draft 2,500 tons d. w. Triple exp. engines $\frac{20 \times 33 \times 54}{40}$. Howden boiler. Launchings July and Sept., 1918. For undisclosed interests.

THE BRITISH-AMERICAN SHIPBUILDING CO., WELLAND, ONT.
"War Weasel" completed, ready for sea. One steamer in fitting out basin, and keel laid for third steamer.

CANADIAN ALLIS-CHALMERS CO., BRIDGEBURG, ONT.
Four steel steamers for undisclosed interests.

WELLAND SHIPBUILDING CO., WELLAND, ONT.
One steel freight steamer, "War Weasel," 261 ft. x 43 ft. 6 in. x 23 ft., 3,300 tons d. w., trip. exp. engines, 14 ft. x 12 in. Scotch boilers, 10 knots, 1,250 h. p. Launching April, 1918.
Two deep frame cargo vessels, "War Badger" and "No. 3," 261 ft. x 43 ft. 6 in. x 23 ft., 3,300 d. w. tons, geared turbines, Howden's forced draught boilers, 10 knots, 1,250 h.p. Launchings June and August, 1918.

PRINCE EDWARD ISLAND

THE CARDIGAN SHIPBUILDING PLANT, CARDIGAN, P.E.I. (Purchased Annandale Lumber Co. plant and removed to Cardigan.)
One three-masted schooner, 325 tons, to be completed November, 1918.

QUEBEC

TIDEWATER SHIPBUILDERS, LTD., THREE RIVERS, QUE.

R. N. LE BLANC, BONAVENTURE, QUE.

J. Z. DEGAGNE, EBOULEMENTS, QUE.

DAVIE SHIPBUILDING & REPAIRING CO., LEVIS, QUE.
Six military barges, 130 feet long.
Eight steel trawlers, 2,035 tons.
One floating crane, 350 tons.
*One steel cargo vessel of 5,000 tons cap.
Building several steel lighters and several wooden drifters.
Steel car ferry "Canora" building for C.N.R., 308 ft. x 52 ft., cap. 20 loaded cars. Speed, 14 knots.

ATLAS CEMENT CONSTRUCTION CO., LTD., MONTREAL, QUE.
One concrete cargo steamer, "Concretia," 125 ft. x 22 ft. x 13 ft., steel ribbed, hull to be from 3 in. to 5 in., thick, for the builder's account.

CANADIAN VICKERS, LTD., MONTREAL, QUE.
Two cargo steamers, 9,400 tons, steel; 1 dredge, 2,364 tons, steel; 12 trawlers, 3,050 tons, steel; 23 drifters, 3,350 tons, wood.
Six freight steamers, 24 ft. draught, 7,000 tons cap., 11 knots, for undisclosed interests. Delivery, 1917, of two for Norwegian interests. "Porsanger," 394 ft. 6 in. o. a. x 40 ft. 4 in. x 30 ft., triple exp. engines, launched Nov. 29, 1917.
"War Earl" launched June 8, 1918, 7,000 tons d.w., 380 ft. x 49 ft. Keel of sister ship laid five minutes after this launching.
One steel freight steamer, 2,360 tons, cap., for undisclosed interests.
Three steel cargo vessels, 8,200 tons, to be laid down in May, Aug. and Sept., 1918, for undisclosed interests.

FRASER BRACE & CO., MONTREAL, QUE.
Four wooden cargo steamers, 3,000 tons, for undisclosed interests. Two keels laid during Oct., 1917.

HALL ENGINEERING CO., MONTREAL, QUE.

MONTREAL DRY DOCK & SHIP REPAIRING CO., MONTREAL, QUE.
Operate dock 428 ft. long 30 ft. deep.

MONTREAL SHIPBUILDERS LTD., 37 Belmont St., MONTREAL, QUE. (Associated with Atlas Construction Co.

THE QUEBEC SHIPBUILDING AND REPAIR CO., Board of Trade Bldg., MONTREAL, QUE.
2 vessels for undisclosed interests 3,000 tons each.

QUINLAN & ROBERTSON, MONTREAL, QUE. (Yards at Quebec.)
Four wooden steamers, for undisclosed interests.

LOUIS GAUNDRY, 12 St. Peter St., QUEBEC, QUE.

QUEBEC SHIPBUILDING & REPAIR CO., ST. LAURENT, QUE.
2 schrs. 1,400 tons and 1,200 tons.
One wooden four-masted auxl. schooner "Martin Connolly," 223 ft. x 42 ft. x 20 ft., 2,100 tons d. w., for undisclosed interests. Launched Oct. 28, 1917.

QUINLAN & ROBERTSON, QUEBEC, QUE.
Four wooden steamers, totalling 6,400 tons, for undisclosed interests.

CANADIAN GOVERNMENT SHIPYARDS, SOREL, QUE.
One steel vessel for undisclosed interests.

H. H. SHEPHERD, SOREL, QUE.
Rebuilding seven drifters. Particulars withheld owing to govt. restrictions.

SINCENNES-McNAUGHTON LINES. SOREL, QUE.
One tug 410 tons, wood.

CAN. GOVERNMENT SHIPYARD, SOREL, QUE.
One steel vessel for undisclosed interests.
Building steam trawlers and wooden drifters for undisclosed interests.

LECLAIRE SHIPBUILDING CO., SOREL, QUE.
Six steel trawlers 125 feet long with single screw triple expansion engines, 500 i.h.p. Two of these launched in November. One more to be launched before ice comes in. Six wooden auxiliary schooners fitted with twin screw "Skandia" engines of 120 h.p. each. These will be all in frame at the end of November and four ready for launching as soon as ice is clear next spring.

NATIONAL SHIPBUILDING CORPORATION, THREE RIVERS, QUE.
"War Mingan" and "War Radnor," launched Oct. 15 and No. 2. Built for the Imperial Munitions Board and will be operated by Anning Bros., Cardiff, Wales. Now building 10 self-propelling barges for France.

HAVE ARRANGED FOR TRADE CREDITS

So Roumania Can Go Ahead and Purchase to Extent of $25,000,000 in Canada

Paris.—Trade arrangements with Roumania, which have been under consideration for some weeks, have been completed, and the Roumanian Government will now be asked to purchase in Canada, $25,000,000 under credits extended.

Of this, one-fifth is to be expended for foodstuffs, one-fifth for raw material and the remainder in manufactured articles. The immediate urgent need of Roumania is for seed wheat, oats, barley and beans, and special efforts will be made to secure shipping to carry the products to Roumania in time for the spring seeding. Other urgent needs are for woollens, railway equipment agricultural implements and tools of all kinds. Livestock is also required. The purchaser will be the Roumanian Government.

Three of the trade arrangements have now been made with Roumania, France and Belgium, and the chief remaining difficulty in setting these trade currents flowing is the serious lack of shipping. Expected Canadian purchase by France and Belgium will be as diversified as in the case of Roumania.

Trade during the next few years with all European countries which have been at war will be more influenced by what credits are available than by any other consideration. American business is keenly alive to this fact. Mr. Frank A. Vanderlip, of the National City Bank, New York, is here in the interest of a huge American banking scheme, by which banking facilities and credits for the encouragement of United States trade are to be through agencies to be opened in every large city on the continent.

Until the return to more normal conditions, trade will follow credits.

VICTORIA MACHINERY DEPOT

The Victoria Machinery Depot has contracts from the Dominion Government for two steel ships of 8,100 tons each, with assurances of further Government orders to keep a two-berth yard fully occupied for at least three years, at prices fair and reasonable, to be determined from time to time.

The establishment of this two-berth steel shipyard in Victoria should mean a decided impetus to the industry of that city, as well as fit in well with the re-establishment and reconstruction policies of the Government, as the extensive works for three years at least should absorb a large share of what might otherwise be a labor surplus.

Since 1898 the Victoria Machinery Depot has been established as an engineering plant, and at the present time is capable of handling every engineering detail in connection with shipbuilding, and probably for this reason was selected by the Government as the Victoria link in the federal chain of steel shipbuilding plants. Work has commenced on the yards for the construction of the hulls, a seven-acre site having been secured from the Provincial Government on the old Indian Reserve. In this yard will be the large plate shops for the fabrication of plates and structural work of the hulls. The vessels will also be outfitted right at the engineering plant, where there is sufficient wharfage to accommodate two vessels at a time.

The vessels under contract will have 3,000 h.p. reciprocating engines, with three boilers measuring 15 ft. 6 in. x 11 ft. 6 in., which will be built at the plant. It is estimated that the work will give employment to approximately 1,500 men, and work will commence immediately on arrival of the steel from the East, which the Government supplies.

The building of the hulls will be under the direction of Mr. J. C. Clarke, engineer-in-charge, associated with Mr. C. J. V. Spratt, president of the company. Mr. R. R. Neild, general manager, will have charge of the engineering plant.

The Victoria Machinery Depot has one of the largest steel marine railways on the Canadian Pacific coast. It hauls out vessels up to 3,000 tons d.w. Vessels in excess of this figure are taken care of by the various shipbuilding yards at the Dominion Government Drydock at Esquimalt.

It is interesting to speculate on what the industrial condition would have been here at this time, had the Dominion Government established steel rolling mills here when repeatedly suggested.

STICKING AT IT

How a British steamer was torpedoed and subsequently brought safely into port is described in her master's report, from which the following account is taken:

"The vessel sailed from Havre at 6.40 a.m. on August 4 last, escorted by two patrol craft, and bound for Southampton in water ballast. At 1.20 p.m. several look-outs gave the alarm, 'torpedo on the starboard beam.' The third officer in charge of the bridge ordered the helm hard-a-starboard. The torpedo exploded as the master reached the bridge. It blew a cadet about 40 feet into the air over the engine-room skylight, and he landed face downwards on the port side of the deck, having been killed instantly. The master kept his engines going full speed until the vessel listed about 23 degrees. No. 3 hold had filled, and the fourth officer reported the engine-room flooding. The master then rang full speed astern until the vessel was stopped, and, as the fires were out, gave orders to abandon the engine-room and lower away the boats. The master, chief officer, fourth officer, chief engineer, third engineer, and a fireman remained on the steamer, the remainder of the crew being taken on board the nearest patrol vessel. The steamer gradually straightened up to a list to 9 degrees to starboard, No. 3 hold, the stokehold, and engine-room filling to the level of the 'tween decks. No. 1 lifeboat had been blown up, the debris wrecking the wireless aerials and falling on No. 4 hatch. All compasses were smashed. The torpedo had struck a few feet forward of No. 3 after bulkhead, starboard side, a hole two feet square being blown through the vessel's side to port.

"On finding she would keep afloat, the master called for volunteers, and his second officer brought over seven cadets and an ordinary seaman from the patrol vessel. The second officer and one cadet were unable to get aboard, and the commander of the patrol craft considered it too risky to allow any more of the steamer's crew to make the attempt. The master therefore connected up the hand steering gear, manned his gun, and headed for port. At 6.25 p.m. a Government towing vessel arrived and took the ship in tow, averaging three knots. At 7.43 p.m. three other towing vessels arrived. During the night these towing vessels parted 15 hawsers and ropes. It took four cadets to steer and two to pass orders, so the remainder were kept hard at work, handling hawsers, etc., until the ship's arrival at Southampton next morning at 10.15."

The master's report concludes: "I consider the behaviour of the officers, engineers, cadets, and crew who assisted in bringing the vessel into port deserving of special mention."

STEAM LEAKS

The loss of heat due to the leakage of steam through a small opening is far greater than most persons are prepared to believe. It is easy to show, from accepted rules and tables for determining the flow of steam through orifices, that a hole one inch in diameter will discharge about 4,640 pounds of steam into the atmosphere per hour, if the pressure in the boiler is 100 pounds per square inch by the gauge. Allowing 30 pounds of water per hour as the equivalent of one horsepower, it is plain that the steam that would pass away through this leak would be equivalent to more than 154 horsepower, so that it would require one good-sized boiler to merely supply the loss through this one hole. Smaller holes would be wasteful in proportion to their areas. A quarter-inch hole, for example, has an area equal to one-sixteenth of that of the inch hole, and it would therefore waste an amount of steam equivalent to one-sixteenth of 154 horse-power, or to nearly 10 horse-power. It is evident from these figures that steam leaks about the boiler, or about its fittings and piping, are exceedingly important, and that great pains should be taken to stop them up promptly. A note should be made of leaks of all kinds, in order that they may not be overlooked when it becomes possible to repair them; but *repairs should never be made upon any boiler or pipe while it is under pressure.*

It should be remembered that steam leaks are sometimes hidden, and are to be found only by seeking for them.



SHIPBUILDING PLANT EQUIPMENT

MACHINE TOOLS,
WOOD-WORKING MACHINERY,
CRANES, TROLLEYS,
STORAGE BATTERY TRUCKS, HAND TRUCKS,
CHAIN HOISTS,
ROPE BLOCKS,
TRANSMISSION,
SCALES,
SMALL TOOLS,
VALVES,
STEAM GOODS,
MOTORS,
PUMPS,
AIR COMPRESSORS,
BOILERS,
ENGINES,
OXY-ACETYLENE OUTFITS,
FLARE LIGHTS,
ETC., ETC.

Fairbanks-Morse Machinery and Supplies will help you to equip your plant most expeditiously and economically.

We have been making a special study of the Shipbuilders' requirements, and will gladly give, on request, full information on a wide line of machinery and supplies.

Equip your plant with Fairbanks-Morse Machinery. Fill the boats with Fairbanks-Morse Supplies.

"Canada's Departmental House for Mechanical Goods"



The Canadian Fairbanks-Morse Company, Limited

St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
Winnipeg Saskatoon Calgary Vancouver Victoria

MARINE NEWS FROM EVERY SOURCE

Vancouver.—The Packers' Association of Vancouver, in their statement, say that last year's salmon pack was the largest in the history of the industry. It consisted of 1,616,157 cases of all varieties.

New Westminster.—Good progress is being made on the five 1,5000-ton wooden vessels for the French Government, building at the New Westminster Construction and Engineering Co. Four of them are in France, and three of these planking and ceiling are in progress.

Toronto.—The Canadian Car & Foundry Co. filled the order for the 12 mine sweepers for the French Government in such a satisfactory manner that they have secured a further order for a number of steel steamers for the same Government.

Vancouver.—The first of the 1,500-ton steamers building in British Columbia for the French Government was launched recently from the Lyall Shipyards. There are forty of these ships, twenty being built in Vancouver and twenty in Victoria.

Victoria, B.C.—It is understood here, by advices from London, that the shortage of tonnage is the main difficulty in the way of large timber orders being placed by the British authorities. Strenuous efforts are being made to provide Canadian vessels, and Hon. T. D. Patullo, Minister of Lands, has suggested the chartering of foreign vessels whenever practicable.

Montreal.—Announcement is made of a drop in freight rates to $1.50 per cubic foot. This is on business between Canada and the British Isles. Of course this is still much higher than the rates that were in use before the outbreak of the war. Shippers take this move to mean that before long the carrying companies will be out looking for business, which certainly has not been the case for some long months now.

Good Order for Locomotives.—The American Locomotive Co. have secured an order for 62 locomotives for foreign roads. Of these forty for the South African railways will be built in the Montreal plant of the company. The engines are to be of the large mountain type, and will weigh from 94 to 97 tons each. The other purchasers are the Provincial Railways of Sante Fe, Argentina and Portuguese East Africa.

Montreal.—Ocean freight rates have been reduced on commercial traffic, and the British Government is releasing a certain amount of space for commercial cargoes. Rates all around show a considerable reduction, and the indications are that by the time the season opens again in the port of Montreal freight rates will have been materially reduced. Three months ago the rate on general cargo was $6.50 per 100 pounds, and now it is $3.50.

Trade With China.—Dr. George E. Morrison, one of the best informed authorities on actual conditions in China, speaking of the possibilities of Canadian trade in China, suggested flour, agricultural implements and machinery, and said that a man of high rank should be sent there to investigate trade conditions. The anti-opium laws are not so well enforced as formerly, but the traffic will ultimately be stamped out.

Flight Across Ocean.—Gen. Brancker, who is giving up his post as Master-General of Personnel in the British Air Ministry to devote his time to commercial aviation, in an interview with "The Daily Express," asserted that a flight across the Atlantic probably would be accomplished in May. He added that the trip was feasible at the present moment, as there were three or four types of airplanes available which were capable of making the flight.

Overseas Trade.—Col. D. Carnegie, ordnance advisor of the Imperial Munitions Board, has every confidence in Canada's future during the reconstruction period. Canada's workmen have proved themselves so skillful in the manufacture of munitions that he thought that it was "only a question of knowing where to go to get a share of the reconstruction work overseas." He did not think there was any immediate danger of over-production in the shipbuilding trade.

Wants a Swing Bridge.—A deputation of the Elgin and Middlesex and St. Thomas County Councils were in Ottawa recently to see Hon. F. B. Carvell, Minister of Public Works. The object of the visitors was to petition the Minister on behalf of harbor extensions and the erection of a swing bridge at Port Stanley. The estimated cost of the alterations would be about $30 000. The Minister, while making no definite promise to the deputation, was impressed by the necessity and promised to take it before council.

Welland.—The Dominion Government contemplates the enlargement of the Government elevator at Port Colborne to double its present capacity by the erection of a new section with a capacity of one million bushels. J. H. Tromanhauser, who built the Maple Leaf mill at Port Colborne, has been asked by the Department of Railways and Canals to prepare an estimate on the cost of the addition, and this work is now under way. The Department has doubtless been actuated in its decision to enlarge by the tremendous congestion of grain in the past year.

Quick Settlement Obtained.—Advice has been received from the Imperial Munitions Board, that all claims on finished contracts for British account will be settled within the next two weeks. The contracts for the United States Government cannot be settled as quickly as those for the British. The adjustments for the American business are being handled by the Imperial Munitions Board as representatives of the United States Government assisted by two American officers.

Big Business Booked.—British shipyards have recently booked orders for well over 100 vessels, representing a very large tonnage. This is probably a record. The Ellerman-Bucknall line alone ordered over 50 steamers on the north-east coast. The British India Company is building nine large liners; the Cunard eight, the Donaldson-Anchor and Donaldson Brothers six, Ellis and Fyfe four, Shaw-Savill-Albion three, Union Castle, Commonwealth and Dominion Companies two each.

Quebec.—The "Canadian Pioneer," launched in December last from the yard of the Canadian Vickers Co. at Montreal, has been fitting out for the last six weeks at Quebec. She is now ready to start on her run to Halifax, the boilers and engines having been fitted and tested. She is now coaling, and will leave immediately her coal is on board. The engineers who have had charge of the installation of the machinery express themselves as quite satisfied with the facilities provided and the labor available at Quebec.

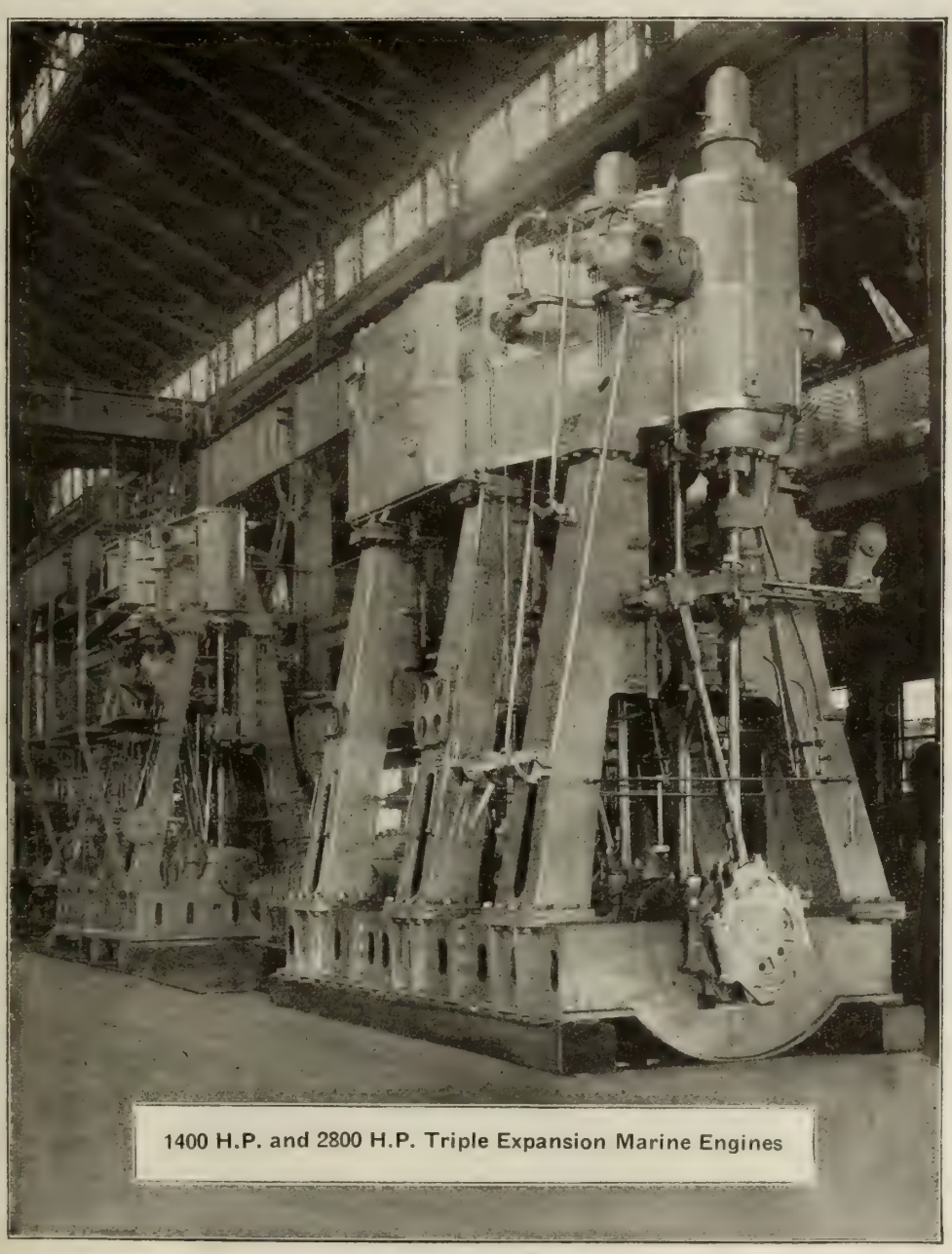
According to a report made at the annual meeting by Managing Director A. A. Bittues, the year 1918 was the best in the company's history, sales increasing 20 p.c. over the figures for the previous year, while the blade production in Canada gained 160 p.c., and razor production 301 p.c. in the same period. It was also announced that the company's steel plant in Sweden was now able to

CANADIAN ALLIS-CHALMERS, LIMITED

ENGINEERS - IRON & BRASSFOUNDERS - BOILERMAKERS - SHIPBUILDERS

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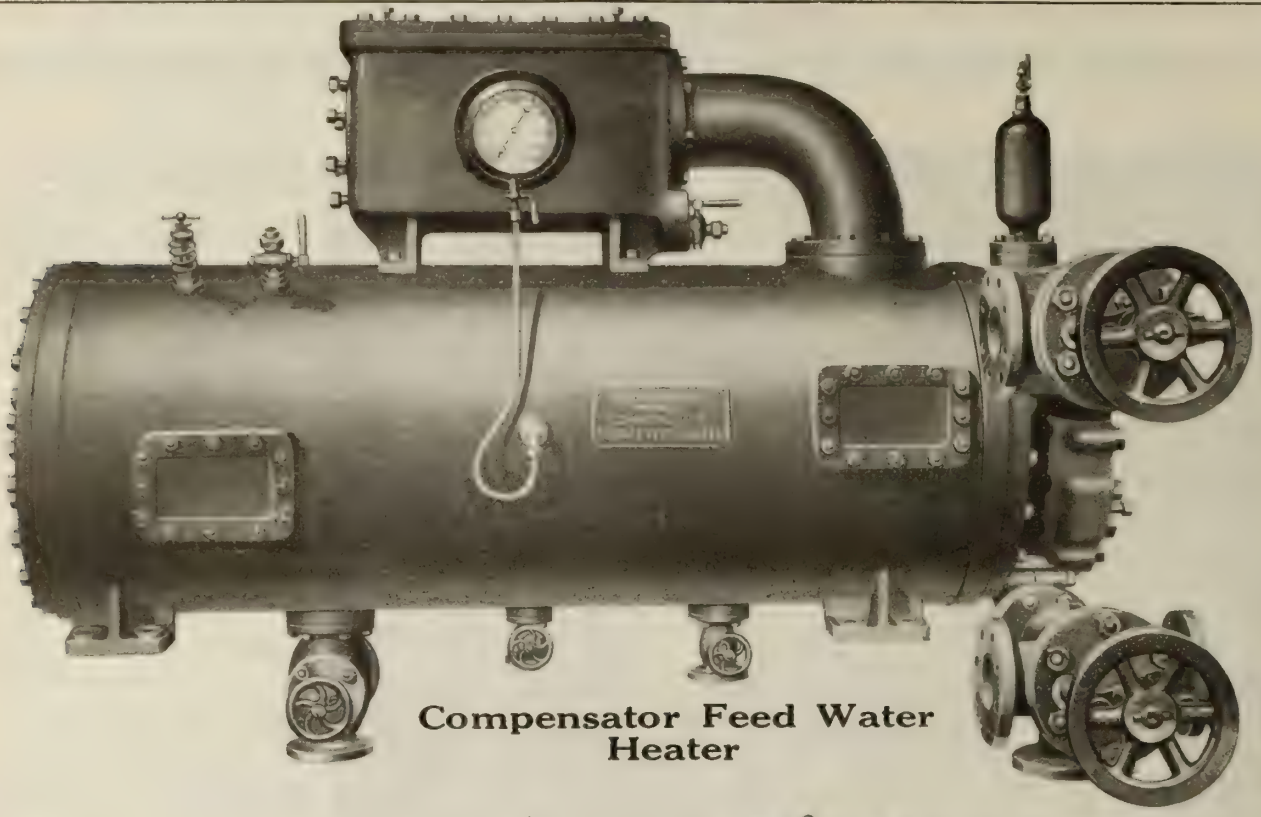
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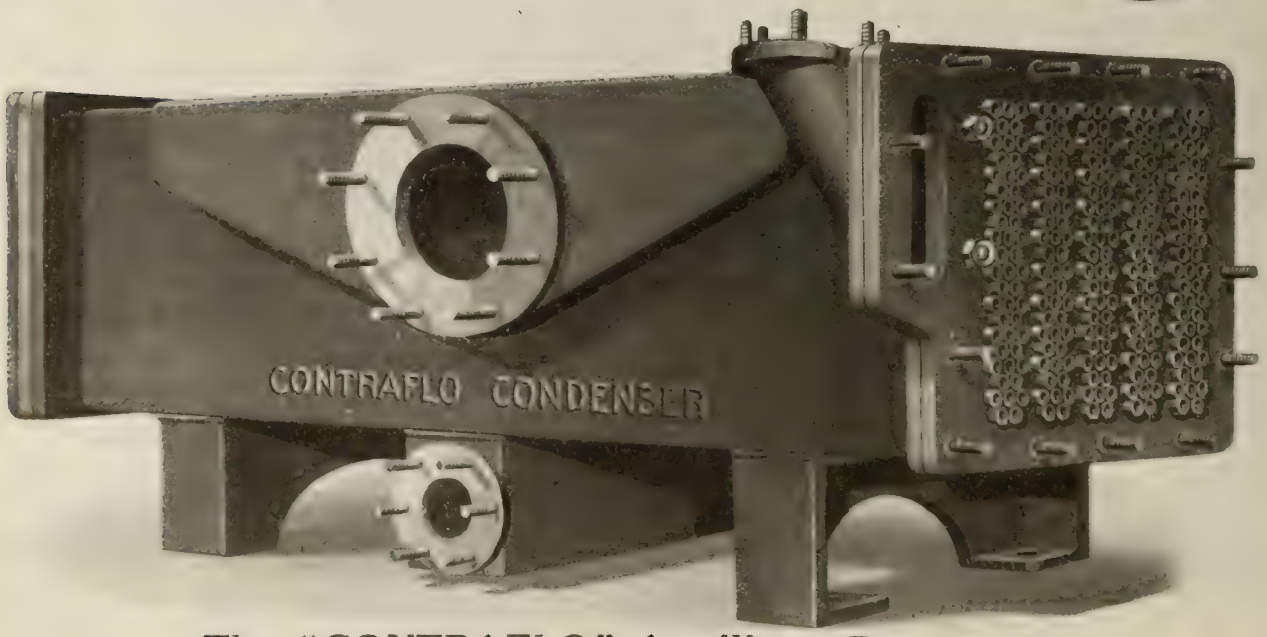
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Compensator Feed Water Heater



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The "CONTRAFLO"
"CASCADE"

Feed Water Heater, Filter and Engine Drain Tank



The "Contraflo" System

Has the following advantages—

MAIN CONDENSER

Saves 20% of tube surface.
Saves weight.
Saves space.
Gives higher vacuum.
Produces more power in main engine.
Smaller quantity circulating water required.
Smaller circulating pump and engine.
Less heat carried overboard in circulating water.
Requires smaller air pump.

AUXILIARY (OR WINCH) CONDENSER

Saves over 50% of tube surface.
Saves 30% in weight.
Saves Space.
Has a feed water temperature control.
Removes oil from exhaust steam.

COMPENSATOR FEED WATER HEATER AND OIL SEPARATOR

Requires less heating surface.
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Saves space.
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Filtering apparatus simplest and most accessible made.
Heats boiler feed water and uses only exhaust steam from auxiliaries and drains from engine receivers, etc.

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Saves money
Saves coal
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Saves space.

This system has been very largely adopted by the BRITISH MERCANTILE MARINE and that of other Nations.

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supply steel in unusual quantities, while shipping facilities, which were approaching normal, permitted them to ship to foreign countries and go after business in a more energetic manner than had been possible during the four years of war.

St. Catharines.—Baldry, Yerburgh and Hutchinson, contractors for section No. 2 Welland ship canal, reopened their office here and will at at once begin the organization of a new staff for a resumption of their section of the work which the Government has authorized after a shutdown of two years. Alex. Grant, formerly of the Trent Valley canal, who succeeds J. L. Weller as chief engineer of the ship canal, was here to-day.

Victoria.—Work on the contract for the French Government wooden ships is proceeding with a vim at the yards of the Foundation Co. here. There is a good chance that if the present rate of construction keeps up the first ship will be launched by the first week in March. The contract is for twenty ships, and eight of them are in various stages of construction. There are at present about 3,000 men on the payroll of the company, and this will be increased when the planking and caulking stages of construction are reached. Work is being carried on in three shifts so that it is practically continuous.

Montreal.—Economy in ocean transportation was the subject of a paper read by A. W. Robinson, M.I.C.E. at a recent meeting of the Montreal branch of the Engineering Institute of Canada. The speaker emphasized the necessity of adopting large vessels of a standard type as an important economic feature in transportation problems. Mr. Robinson considered the most simple and direct method of reducing operating costs was to increase the capacity of cargo ships so they could carry more tons of freight per unit of labor and material. Co-ordination, co-operation and standardization were the keynotes of the address.

Liverpool.—A shipowner and shipbuilder of the United States, interviewed recently at this port, had some interesting things to say of the United States shipbuilding programme. The gentleman in question was Mr. Christopher Hannevig, and he characterized the United States programme as an orgy of extravagance and miscalculation. He says that the Shipping Board entering on the construction of so many ships at once, created a situation that was speedily exploited by labor, with the result that costs went soaring to a degree hitherto unknown, and beyond all hope of profitable operation.

Work Kept in Canada.—At a meeting of the District Trades and Labor Council the decision of the Government not to allow any further contracts for engines and boilers to be given out of Canada was made known. The Union of Machinists had requested the Minister of Labor's support to their demands for a thirty-three hour week, as a measure to relieve unemployment. Delegate John Munro said that as a result of their action, the Government intended to give the contracts for two ships to Toronto, stop any contracts for engines and boilers going out of Canada, and was going to give contracts immediately for a number of locomotives.

Marine Needed.—That Canada should have a merchant marine, is the opinion expressed by J. J. Walsh, secretary of the Toronto branch of the Canadian Manufacturers' Association. "We have taken an active part in making representations to the Government to that effect for quite a numbers of years," he said, "and it is absolutely necessary that the Government should continue its program." Mr. Walsh also stated that a representative of the C.M.A. would accompany the deputation to Ottawa on Thursday to lay Toronto's case, relative to the shipping situation faced as a result of the Government's failure to provide further orders, before the Cabinet.

Will Keep Working.—On Tuesday and Wednesday of last week, W. A. Janssen, operating manager of the Canada Steel Foundries was in Welland on business in connection with the local branch of that corporation. Following his visit it was decided to continue operations as at present. The operation of the rolling mills will be continued. The position of the Steel Foundries is much the same as it was two months ago. The business of the concern is dependent on the general condition of the country, and if this remains good the business of the Foundries will continue as formerly. "As far as I can see," stated the manager, "prospects are good, and there is no danger of a setback."

Lumber Men Not Jumping.—The lumber men of Ontario are sending a representative to Great Britain to look for lumber orders for reconstruction work. The lumber interests in Quebec are not

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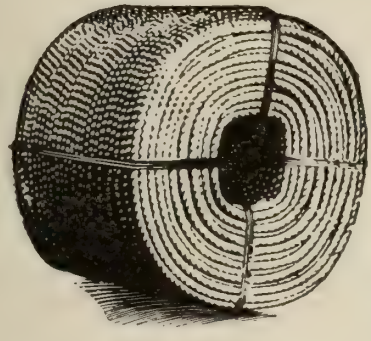
FOR SALE—TWO 360 H.P. DUESENBERG marine engines, new, 8 cylinders, 6¾" x 7¾"—each $5,000. Also a 72-foot new motor boat, equipped with three of these engines, speed 35 miles an hour, cost $52,000—our price, $35,000. Box 151, Marine Engineering. mtfe

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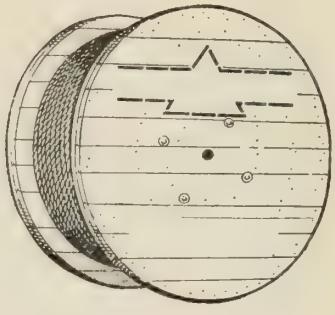
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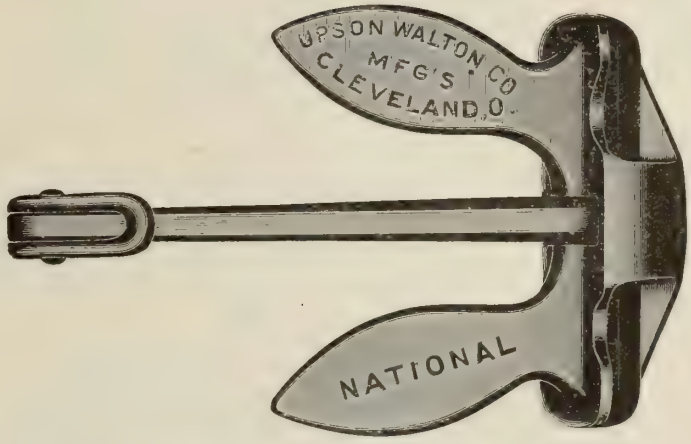






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following this course, but are taking the attitude that the Government can submit their requirements and then the lumber men will bid on them. They agree that there will be a lot of lumber required in Europe, and the question will be to secure sufficient lumber and ships to supply the demand. They all agree however that they cannot sell lumber to the British and French Governments at the last prices paid by those Governments, and they are inclined to sit tight and see in which way events will shape themselves.

London, Eng.—The president of the British Board of Trade, speaking at Huddersfield recently, said that the Government were anxious to remove all restrictions as fast as it could be accomplished, but restrictions on exports must be maintained in the interests of allied nations. The blockade must also be maintained. He also made the statement that there was more shipping available than cargo tonnage to employ it, and a big slump in freight rates was bound to occur. This does not necessarily mean that tonnage is up to its former level, but that in the restricted state of trading there are more ships than are required to handle the freight available.

Toronto.—C. A. Bogert, retiring president of the Toronto Board of Trade, in his address to that body, said: "Let us not entertain any illusive hopes respecting the future of shipbuilding in Canada. It is possible that the ships that are now being built for the Canadian Government will cost us at least double what they could be constructed for in a year or two hence. Shipbuilding conditions in this country do not compare favorably with those prevailing in Great Britain, or any other European centres. The enormous tonnage being launched all over the world will soon overtake the demand, and with rates decreasing in consequence, returns on the original investment of capital will be wholly inadequate."

Port Huron, Mich.—Supt. A. R. Morrison, of the Foundation Company, says that the company is making ready for the construction of what will be one of the largest drydocks on the Great Lakes. It will be 659 feet long and will have sufficient depth and breadth to accommodate the largest boats on the lakes. A wharf 1,100 feet long is now under construction for boats which will moor at the plant. Mr. Morrison says that contracts for the ten steel tugs for the French Government have been cancelled. His statement dispels rumors that the Port Huron plant is to be only a temporary affair. The construction of the dry-dock will be rushed in the spring. Meantime repair work will be done on five steamers. The two sections of the steamer Paipoonge are now in drydocks being welded together. Matters are now being adjusted with the steel mills to provide a supply of steel.

Richard Llano Newman, naval architect and consulting engineer, who, until the end of last year, was resident in Montreal, died recently of influenza at West Point, Virginia, where, as president of the New York River Shipbuilding Corporation, he had gone to construct ships for the United States Emergency Fleet. Mr. Newman was born at Devonport, England, where his father was an important official of the Naval Dock Yard, but had lived in Canada and the United States about thirty years practising his profession. Mr. Newman lived for a time in Ottawa, where he did work for the Department of Marine and Fisheries in designing and supervising the construction of vessels for that department. He also designed and supervised the construction of ships for the Grand Trunk and Pacific Railway.

Hamilton.—The annual report of the Harbor Commission shows that considerable work has been done in this regard, most important being a complete hydrographic survey, including Desjardine canal up to Dundas, in the course of which $5,000 soundings were taken. The new industrial area on the waterfront between Ferguson avenue and Wellington street, comprising about fourteen acres, is now in splendid condition. This industrial area is provided with a dock wall across the front of 650 feet and 1,150 feet on the east side, making a total of 1,800 feet of dockage, with a depth of water throughout of 18 feet. Railway connection can easily be made to this property from the railway lines which are already close to this point, and with the co-ordination of rail transportation and water shipping facilities, no finer factory sites could be found on any harbor on the Great Lakes.

EFFECT OF SCALE UPON EFFICIENCY

The stony matter and muddy deposits that form upon boiler shells and tubes are poor conductors of heat as compared with the metal of the boiler, and hence they tend to diminish the efficiency of the boiler by lessening the absorption of heat. There is a good deal of misinformation to be had on this point from the books that have been written about boilers and boiler practice. Thus it is often taught that a coating of scale 1-16 of an inch thick diminishes the efficiency of the boiler by 25 per cent., similarly definite statements, showing a further rapid decline of efficiency, being made for greater thicknesses. If the figures that are usually given were correct, it would follow that the boilers of the United States, as a class, are very wasteful indeed: for it is unusual to find a boiler that has not a scale at least 1-16 of an inch thick upon it, except in regions where the feed water is quite soft and pure. There is no doubt about scale diminishing the efficiency of the boiler, but the loss cannot be stated in any simple way, because it varies a great deal according to the character of the scale. If the scale is compact and impervious to water, as is usually the case when it is composed of lime sulphate, the loss of efficiency may be considerable; while if it is quite porous, so that water can percolate through it through it easily, the loss may be sensibly less. The boiler should be kept as clean as possible, at all times;—not only because the scale diminishes the efficiency, but also because it is often a source of acute danger, since it tends to damage the boiler by causing the metal to become overheated and burned.

ALL-STEEL FACTORY AND SHOP EQUIPMENT BECOMING THE RULE

High-grade furniture steel has proven most adaptable and versatile in the construction of factory and shop equipment such as cabinets, shelving, stock-room partitions, lockers for employees and for material, etc., and is fast being adopted by Canadian firms generally.

There are many reasons for the universal use of steel in such items of equipment, chief among which are its quality of being fireproof, its capacity to bear heavy weights, its indestructibility, its capacity for standardization, permitting a concern to start with a small amount of steel equipment and add other uniform pieces as requirements demand, and its low ultimate cost as compared with wood.

The Dennis Wire & Iron Works Co., Limited, of London, Ont., have pioneered in this industry in Canada, and have achieved for their well-known line of "DENNISTEEL" factory and shop equipment a very high reputation for quality and durability.

Recent figures on work just completed for the John Bertram & Sons Company, Dundas, Ont., are of timely interest. In the warehouse for small tools alone, this company had no less than one-tenth of a mile of DENNISTEEL shelving installed, with bin fronts, label holders, etc., besides a great many stacks fitted with drawers for small drills, taps, etc.—aggregating a total of some 1,200 drawers, each with label holder to indicate contents. These stacks are built to carry extremely heavy weight on account of the nature of the material stored. The standard DENNISTEEL type shelving and drawers was used in anticipation of the necessity of adding similar units from time to time.

All this equipment was planned and installed so that the stacks, instead of being placed along walls, run out from the walls to the centre of the warehouse, leaving passageways between, and the layout is such that between each row of stacks there is a window, providing sufficient light and air. All stacks extend the same length, and the whole presents a most orderly, uniform appearance, and will make the task of stock-taking comparatively simple.

For the same firm, the Dennis people are installing some 200 steel wardrobe lockers for the use of employees, besides complete equipment of steel tables, footrests, stools, etc., in the drafting room, the whole making one of the most up-to-date installations of all-steel units in the Dominion of Canada to-day.

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J. M. T. Reducing Valve. Pressure Valve for Steam or Air.



Bells and Gongs of every description.

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They represent highest quality and extraordinary construction, which is evident in their long, reliable service.
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Beaver Combined Stop and Check Valve.

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Globe Stop Valves



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Gauge Glass Protector

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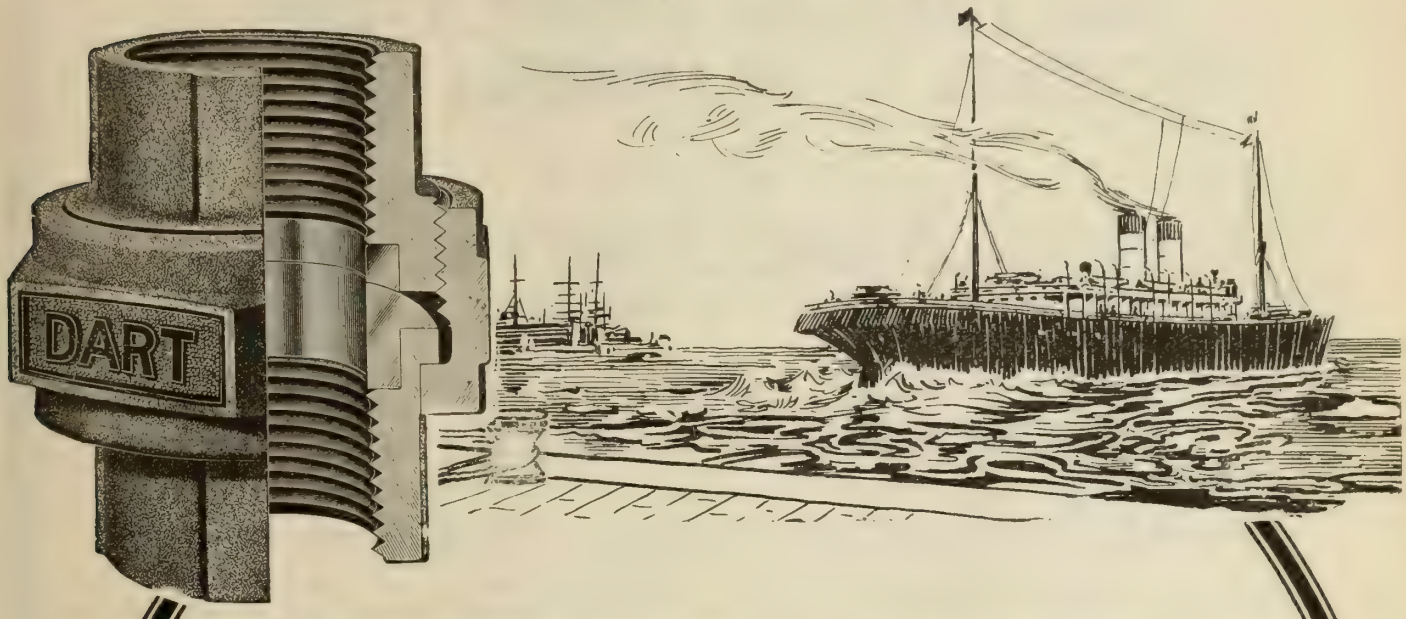
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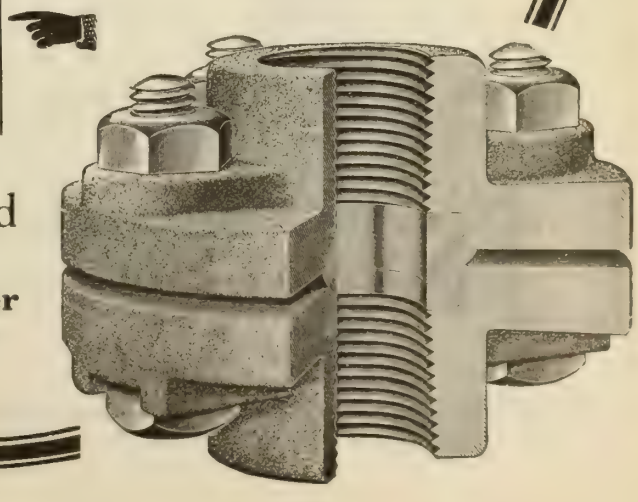
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Liberal proportion of Iron parts prevents stretching or pulling apart under strain or heavy pressure.

Doesn't cost a cent for upkeep, Never has to be replaced, No leaks to cause damage

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easily and without cost. Repeated use does not affect their efficiency. This feature plus Dart Union Reliability makes them a real investment.



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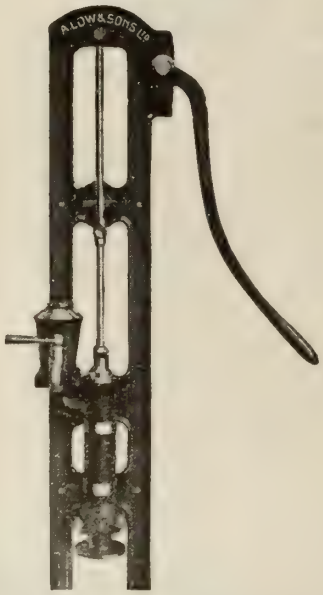
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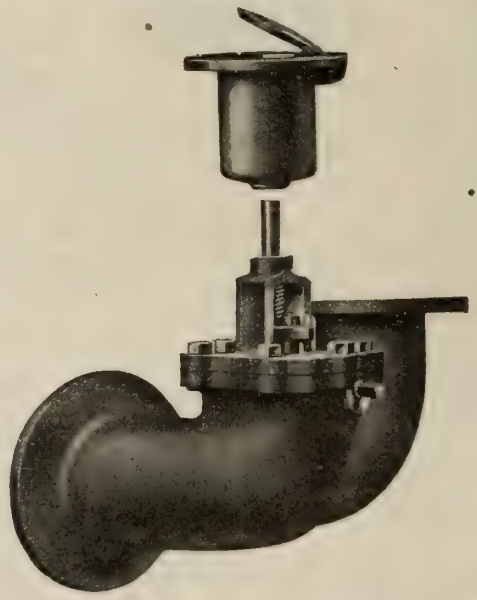
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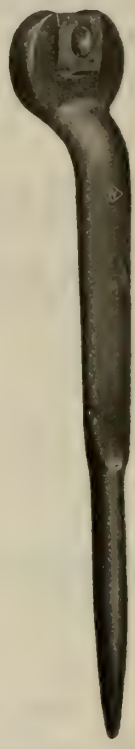


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The *tang* on the end of the handle is for bringing bolt-holes into line and for insertion into convenient openings when the wrench is not in use, thus preventing loss and keeping the tool in sight.

The *offset* in the handle of the Structural Wrench provides for clearance of obstructions and safety for the hands of the operator.

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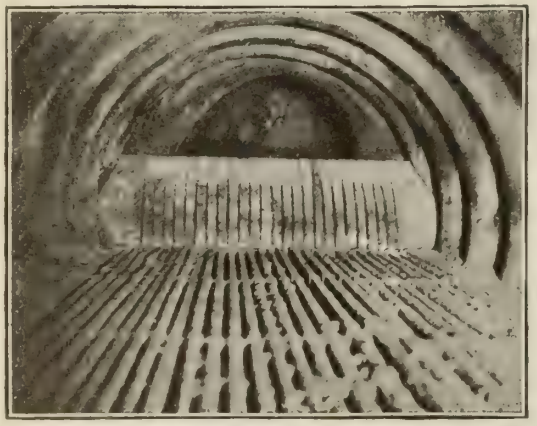


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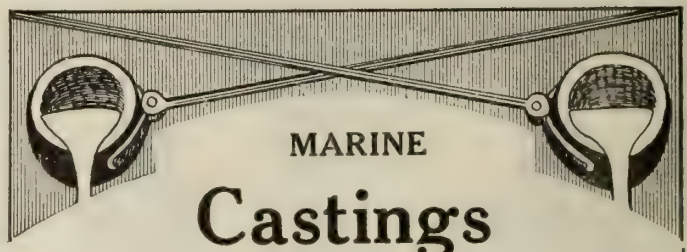
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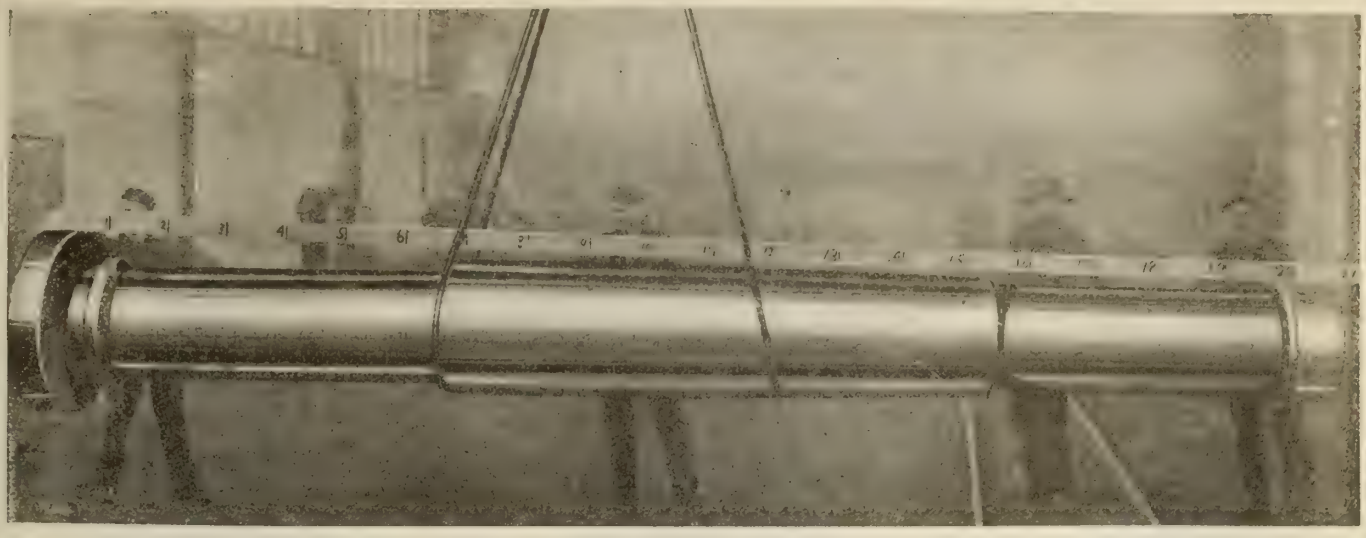
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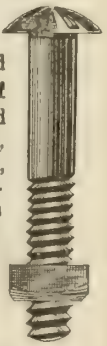
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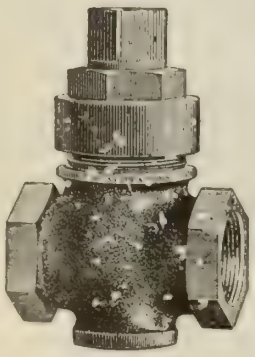
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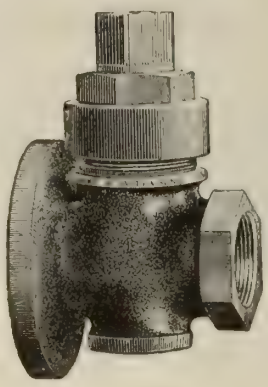
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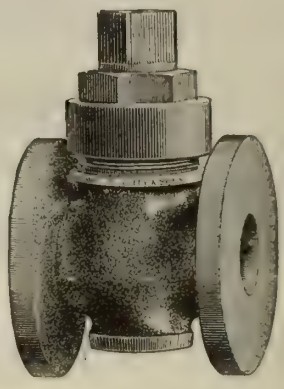
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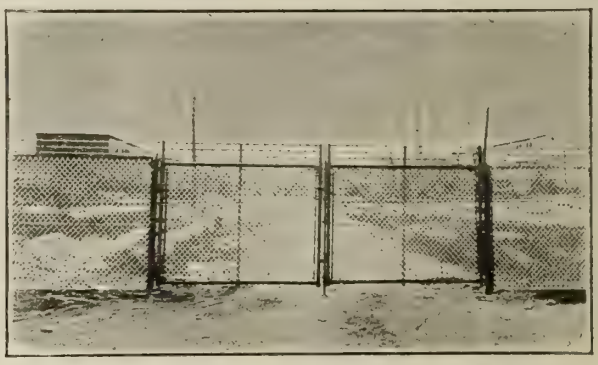
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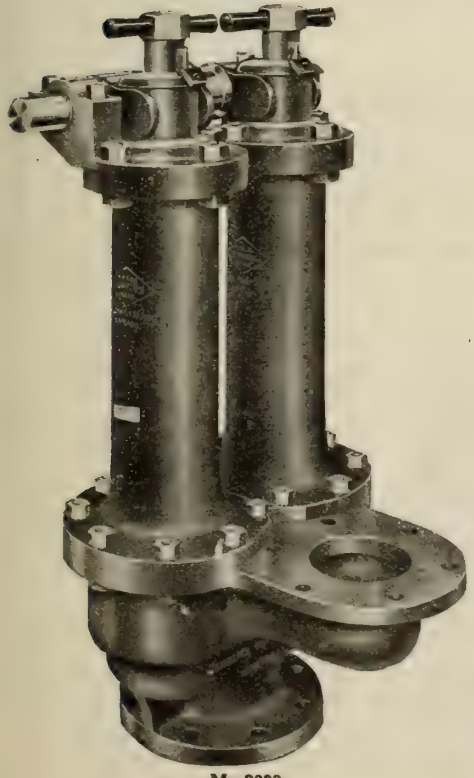
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Some of the Outstanding Articles and Stories are:

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The Voice of Canada Interpreted

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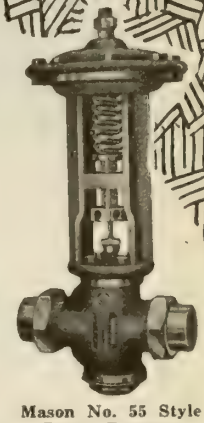
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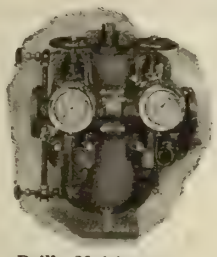


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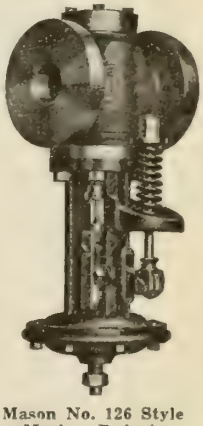
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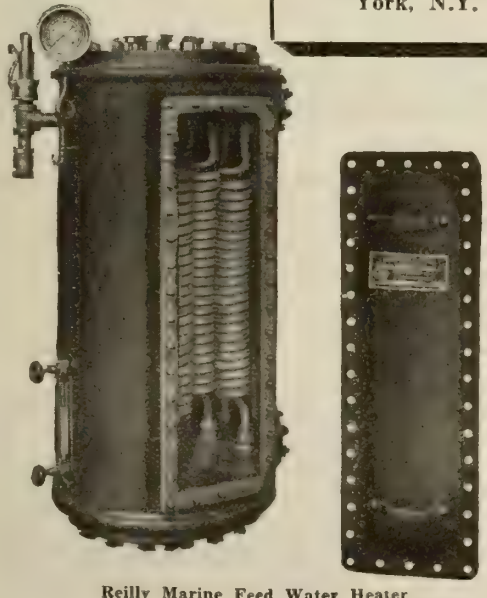
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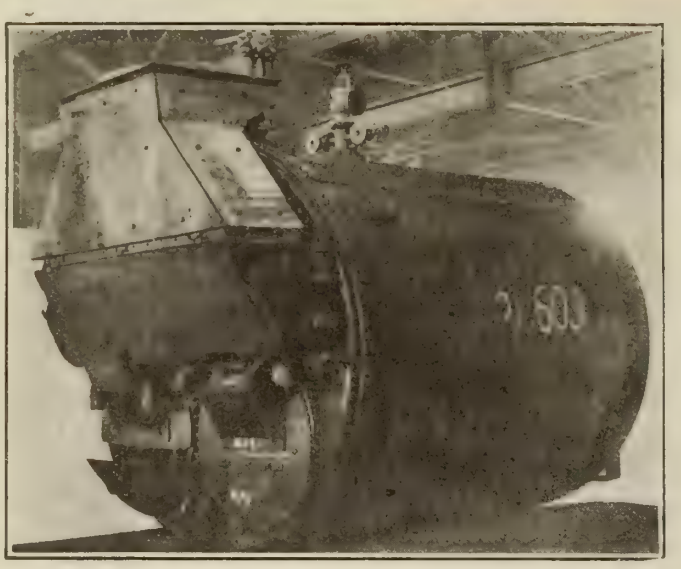
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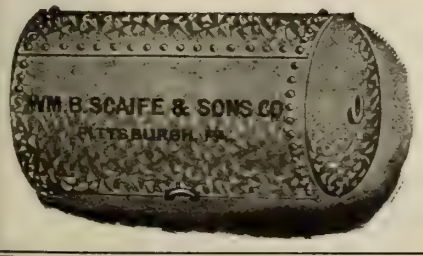
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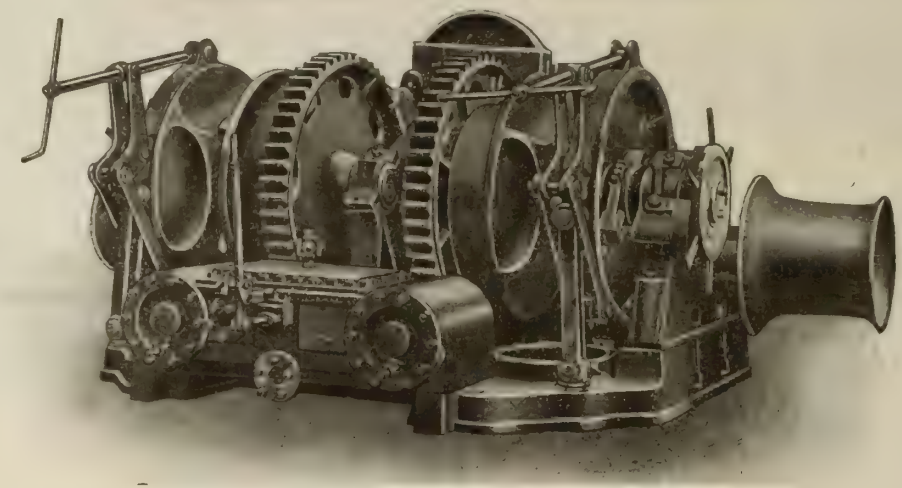
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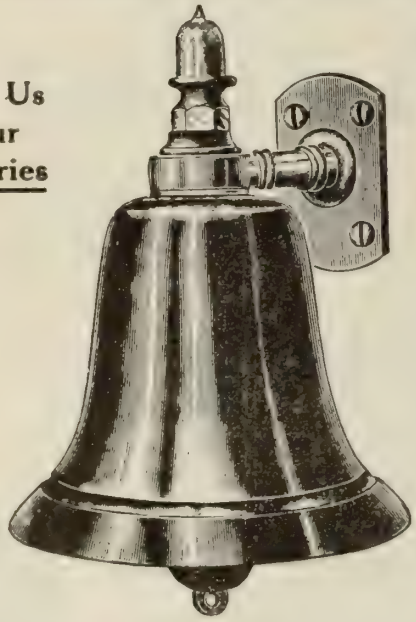
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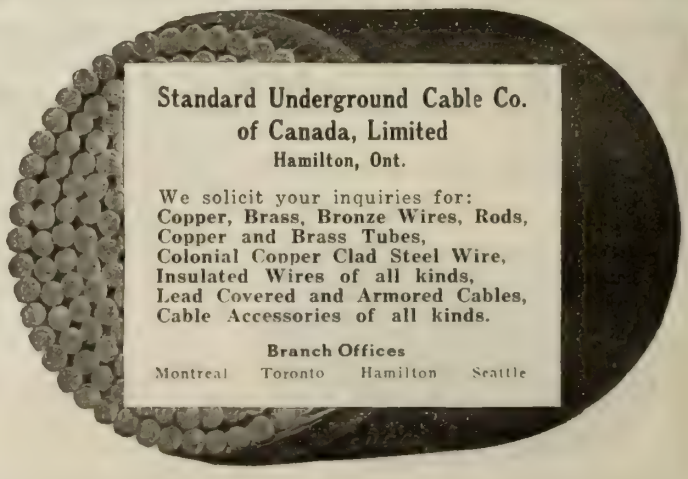
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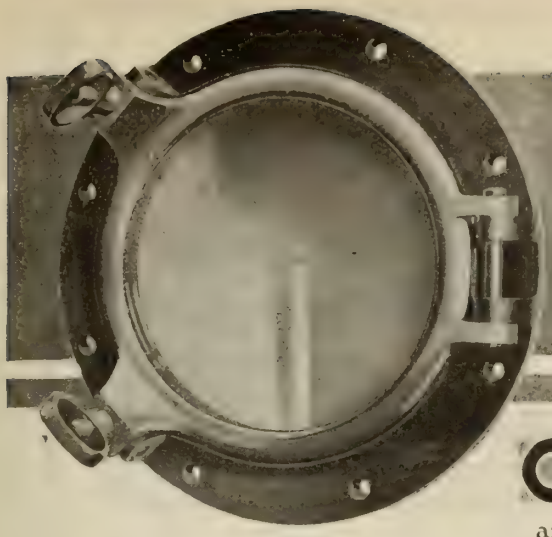
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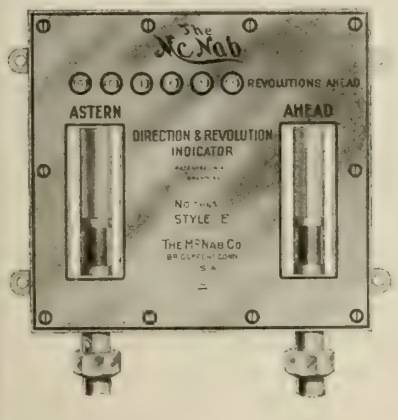
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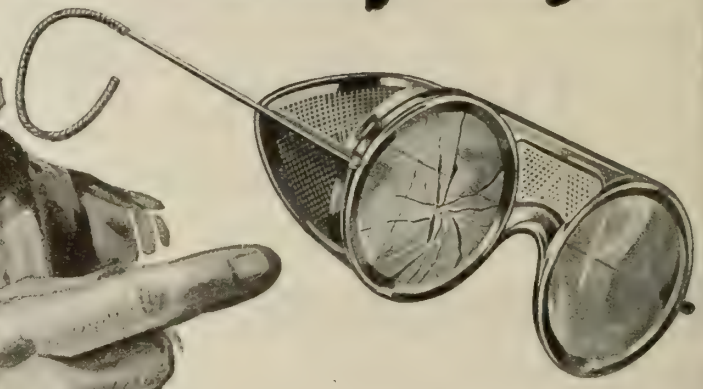
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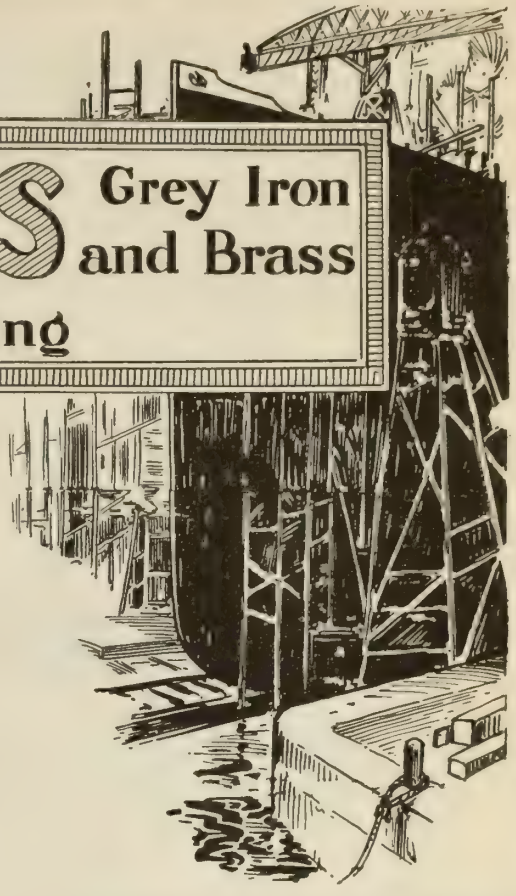
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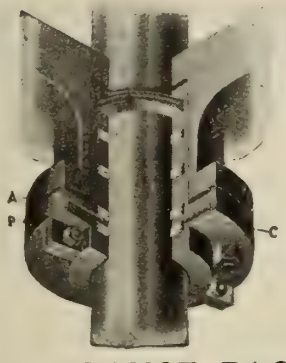
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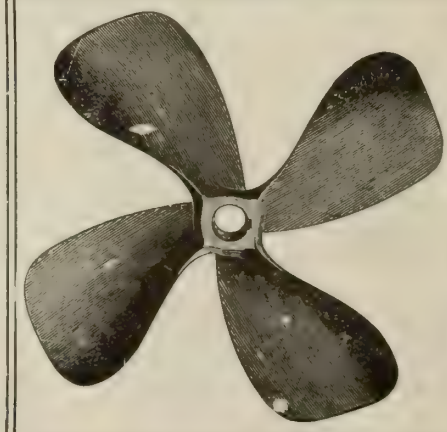
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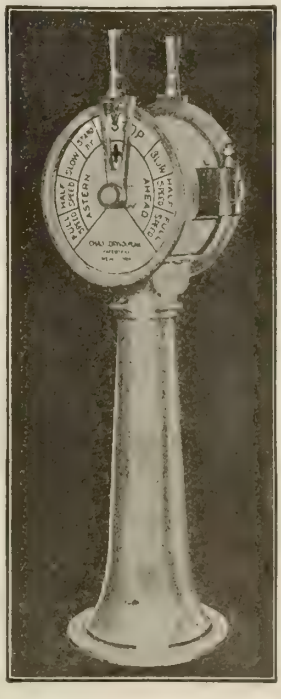
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We are reminded of a story. A railroad man, born in Canada, was revisiting his home town on the St. Lawrence River. He wandered up to a group of old-timers who sat in the sun basking in blissful idleness. "Charlie," said one of the old men, "they tell me you are getting $20,000 a year," "Something like that," said Charlie. "Well, all I've got to say, Charlie, is that you're not worth it."

A salary of $20,000 a year to these do-nothing men was incredible. Not one of the group had ever made as much as $2,000 a year, and each man in the company felt that he was a mighty good man.

Charlie had left the old home town when he was a lad. He had got into the mill of bigger things. He developed to be a good man, a better man, the best man for certain work. His specialized education, joined to his own energy and labor sent him up, up, up. To put it in another way: Charlie had always more to sell, and the world wanted his merchandise—brain, skill and ability. Having more to sell all the time, he got more pay all the time.

Charlie could have stayed in the old home town; could have stagnated like others; could have been content with common wages. In short, Charlie could have stayed with the common crowd at the foot of the ladder. But Charlie improved himself and pushed himself, and this type of man the Goddess of Fortune likes to take by the hand and lead onward and upward. Almost any man can climb higher if he really wants to try. None but himself will hold him back. As a matter of fact, the world applauds and helps those who try to climb the ladder that reaches towards the stars.

The bank manager in an obscure branch in a village can get out of that bank surely and swiftly, if he makes it clear to his superiors that he is ready for larger service and a larger sphere. The humble retailer can burst the walls of his small store, just as Timothy Eaton did, if he gets the right idea and follows it. It is not a matter of brain or education so much as of purpose joined to energy and labor. The salesman or manager or bookkeeper or secretary can lift himself to a higher plane of service and rewards if he prepares himself diligently for larger work and pay. The small manufacturer, the company director, the broker—all can become enlarged in the nature of their enterprise and in the amount of their income—by resolutely setting themselves about the task of growing to be bigger-minded men.

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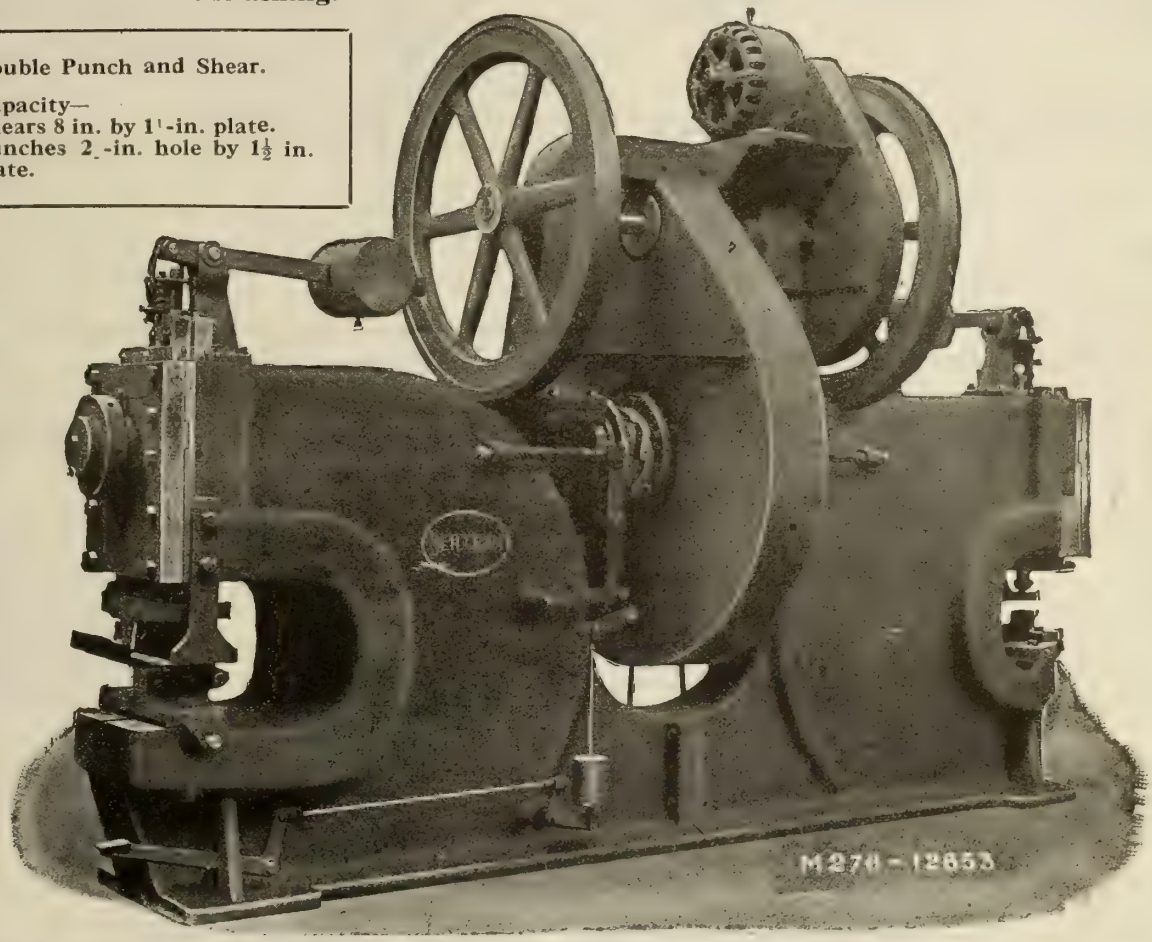
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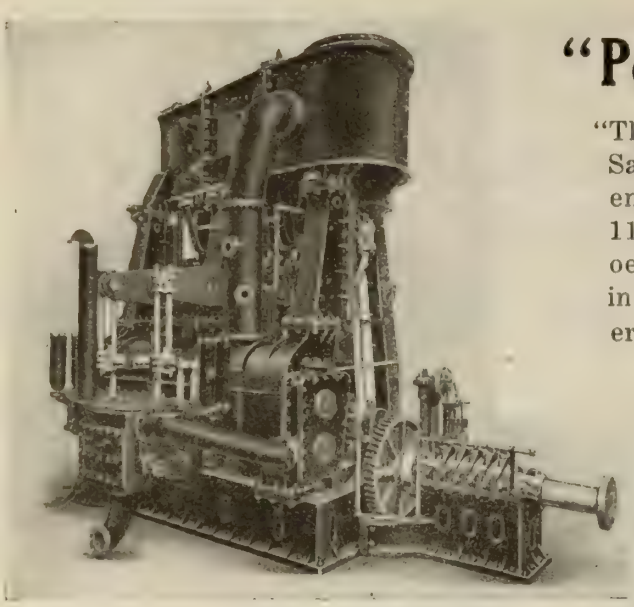
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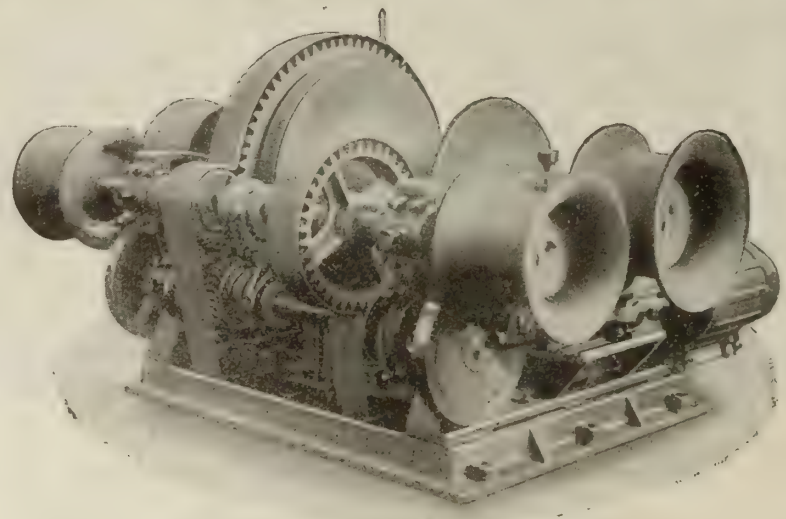
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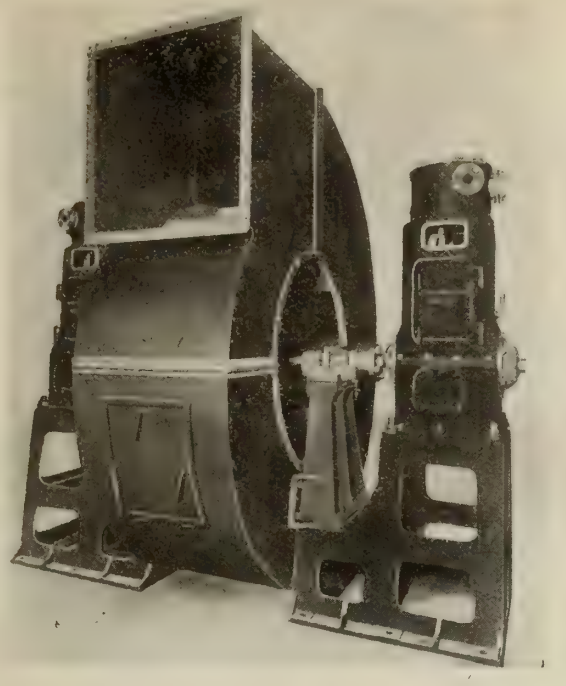
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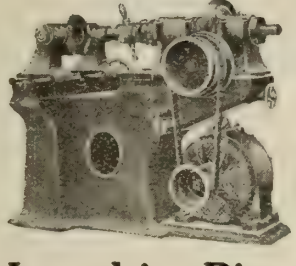
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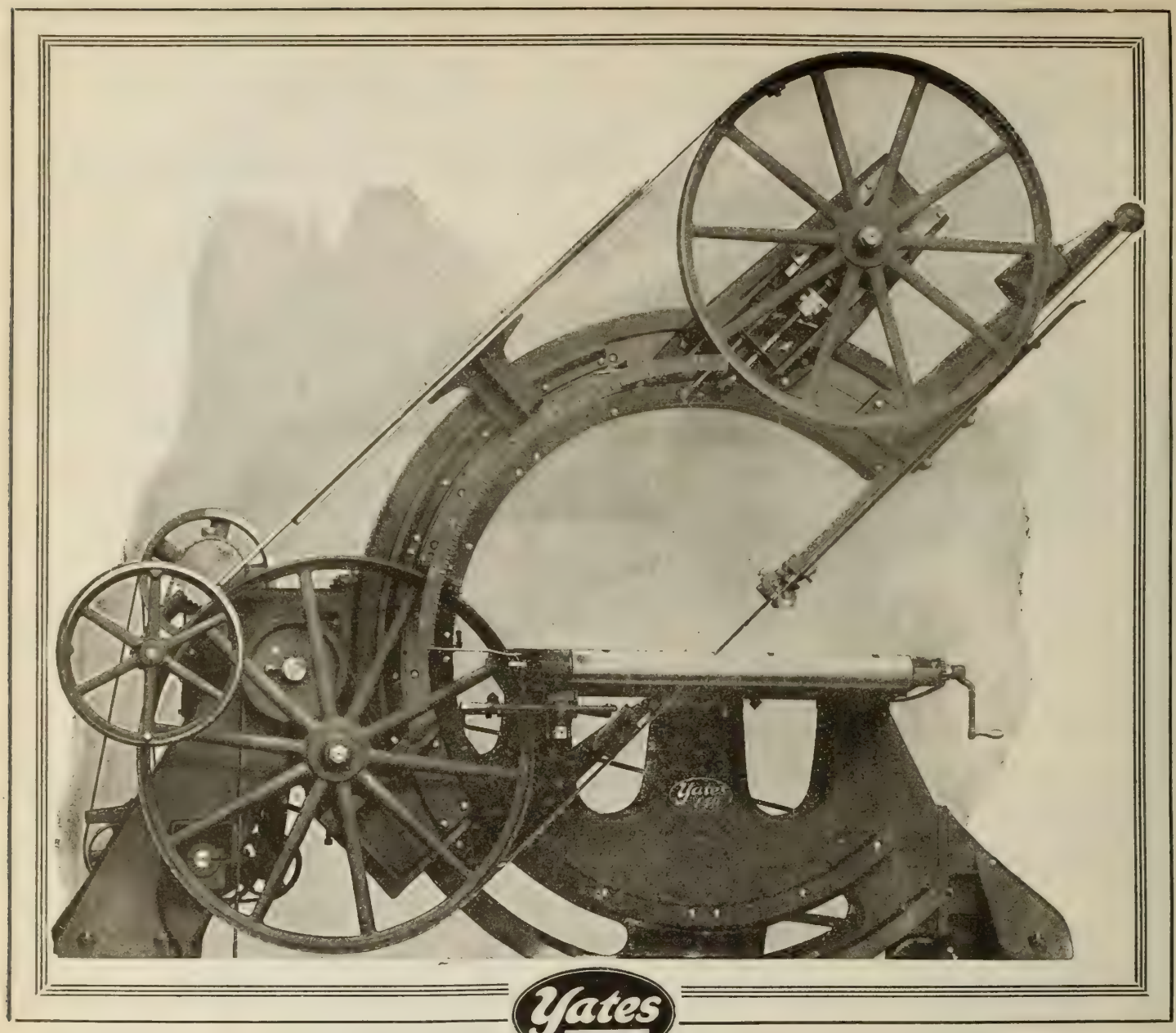
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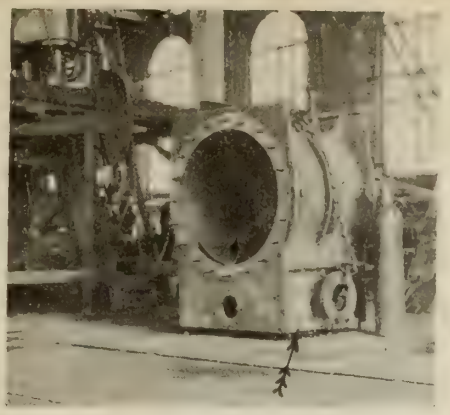
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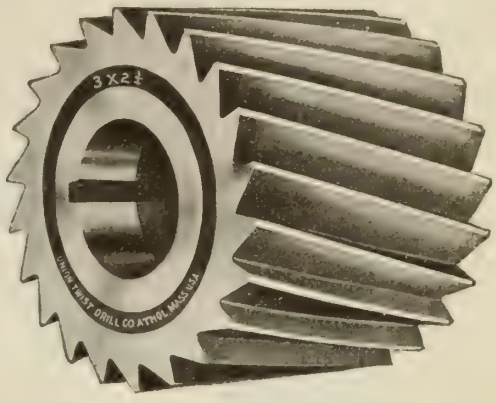
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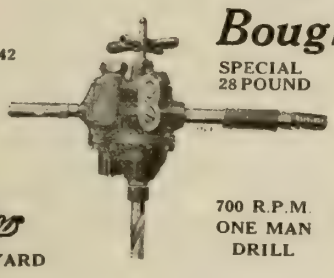
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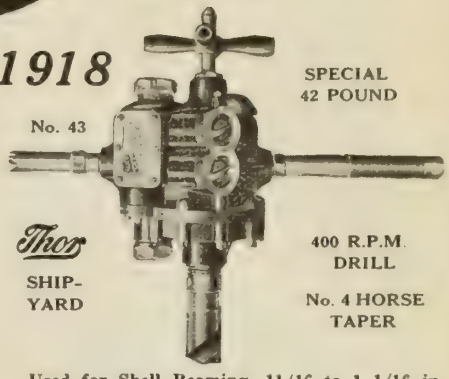
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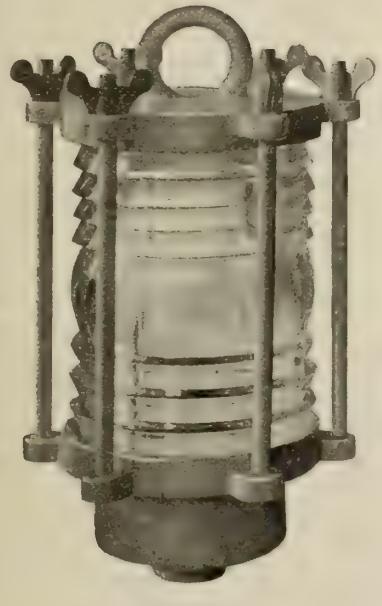
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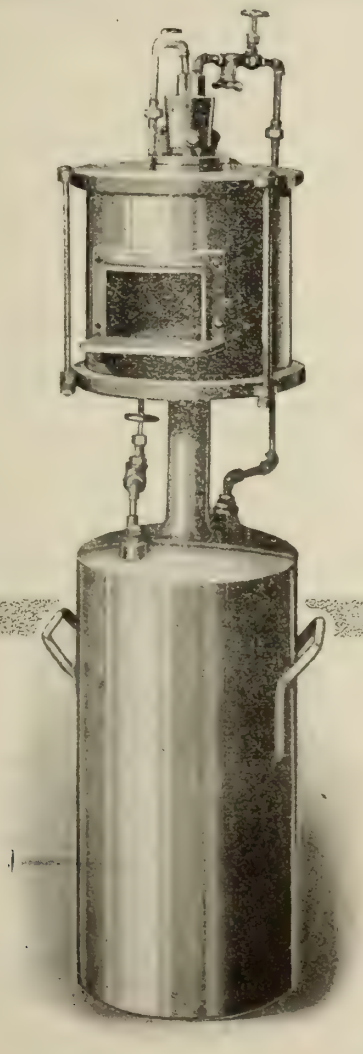
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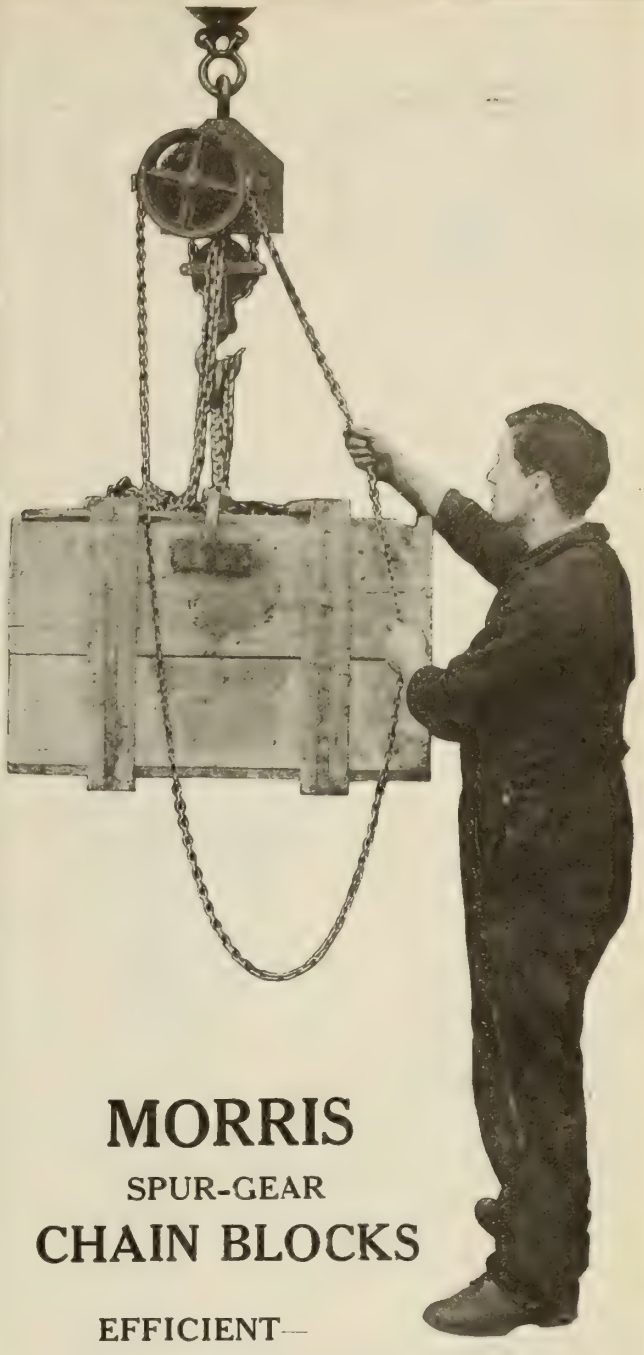
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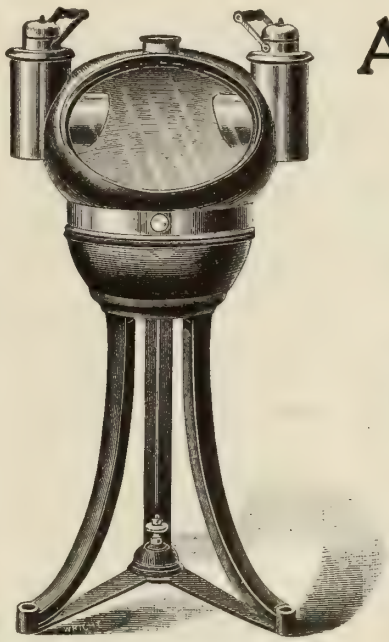
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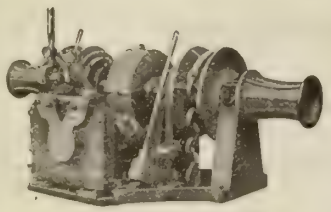
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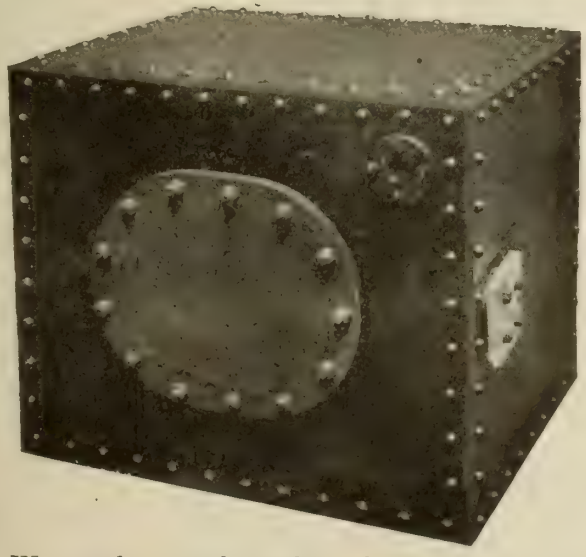
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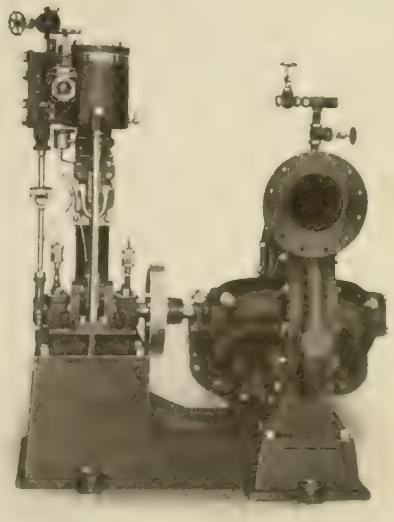
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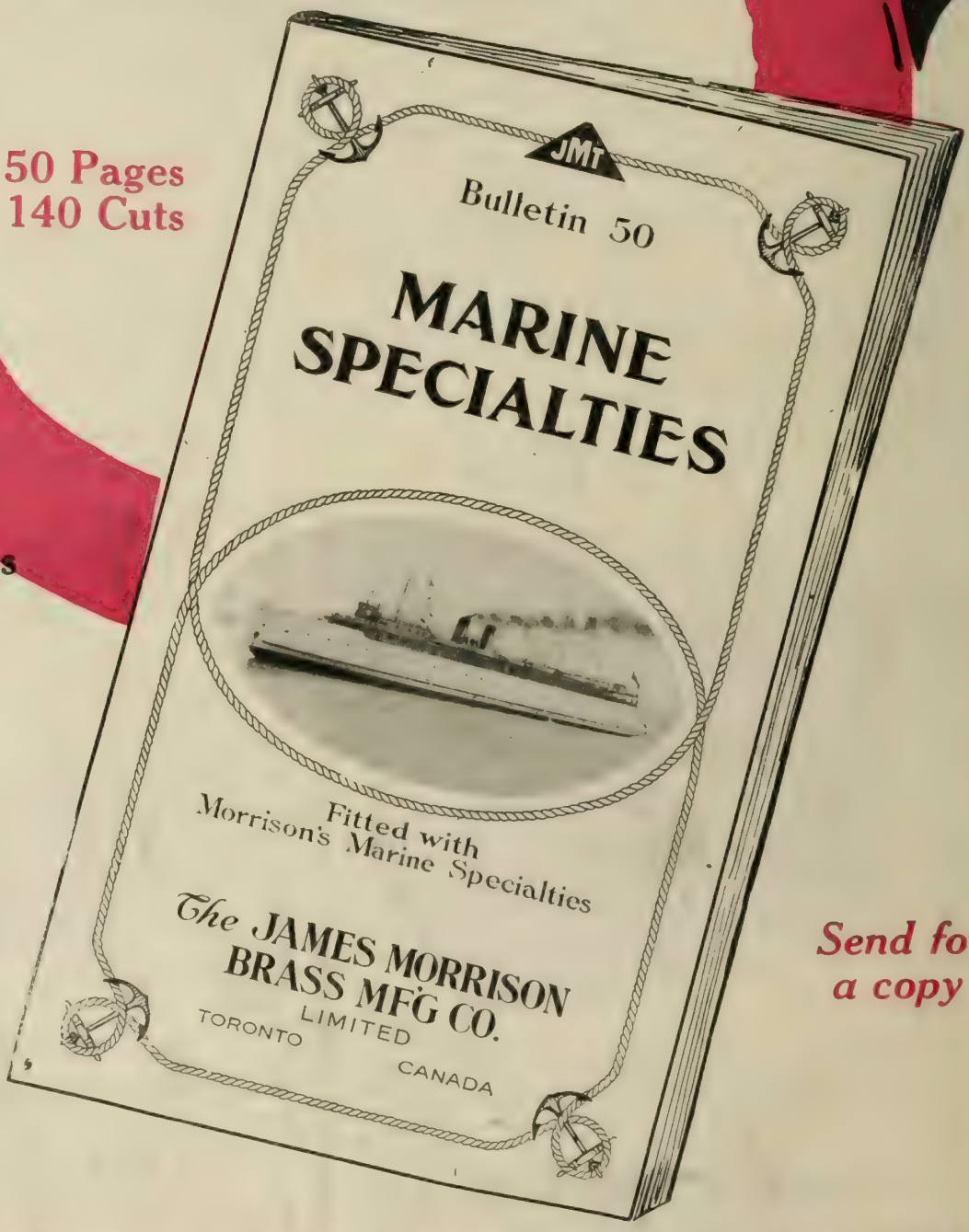
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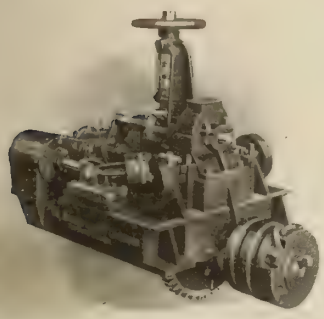
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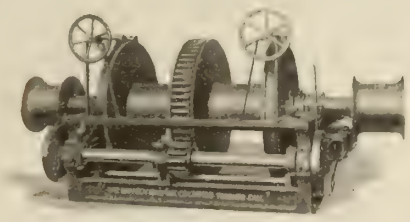
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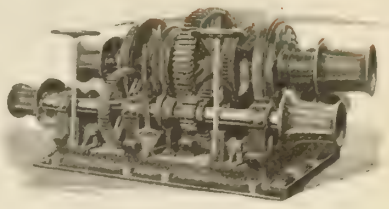
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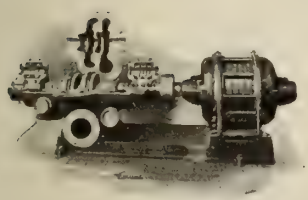
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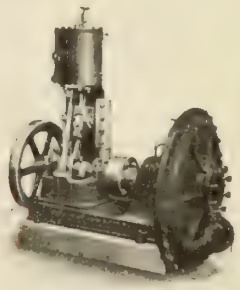


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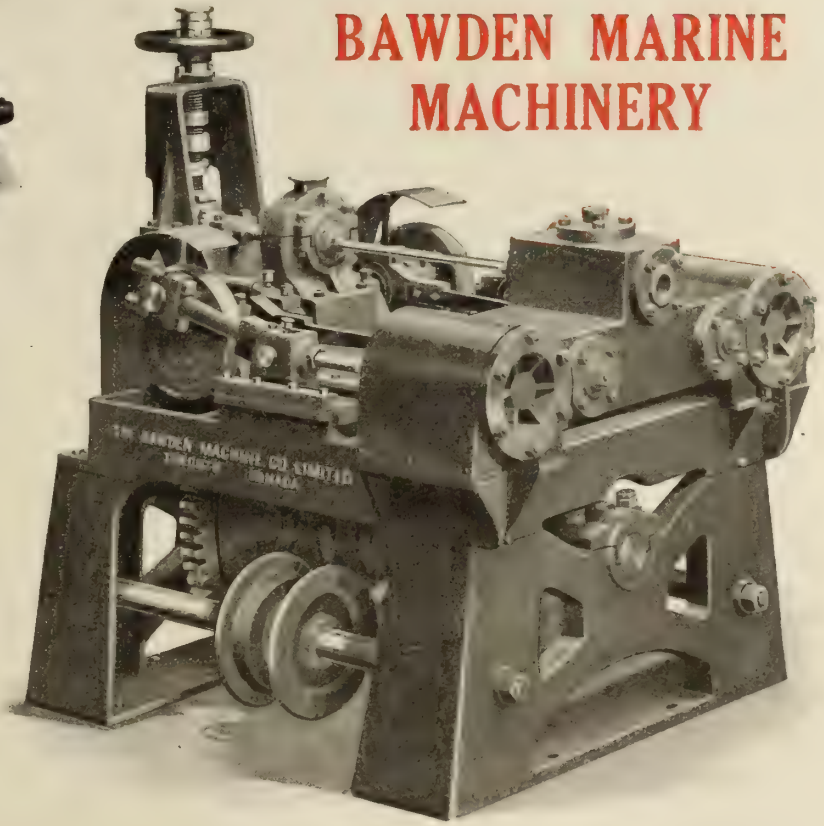
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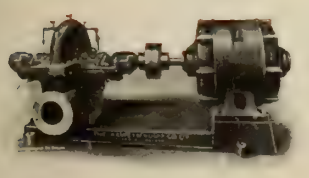
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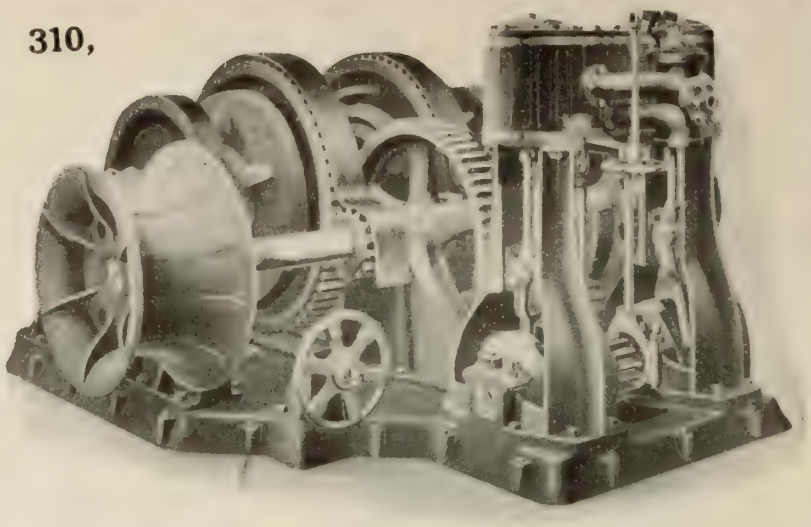
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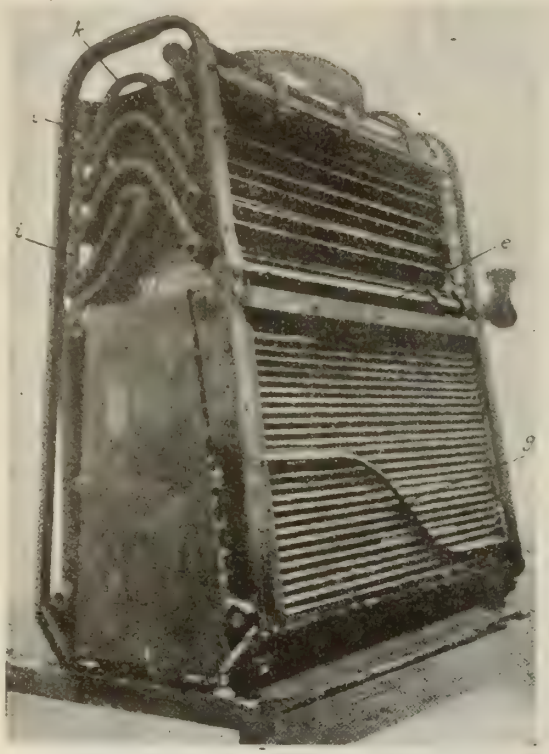
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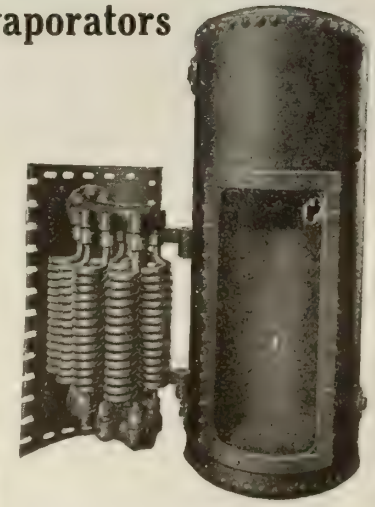
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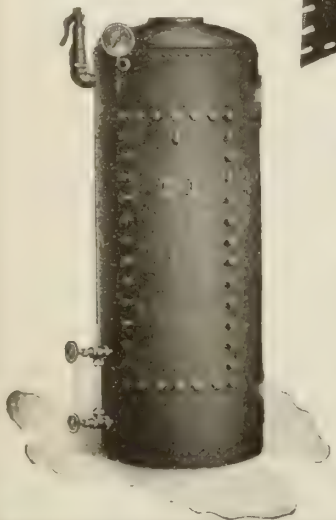
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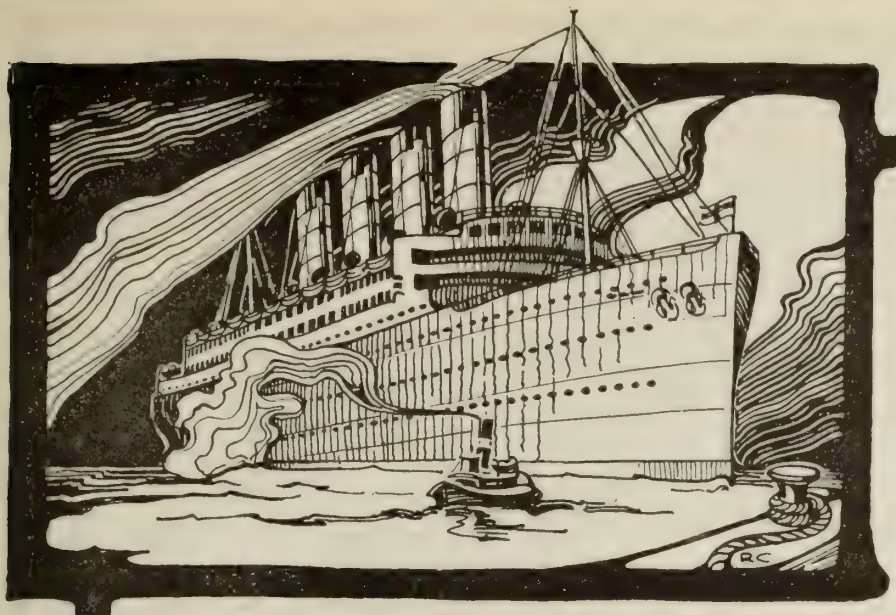
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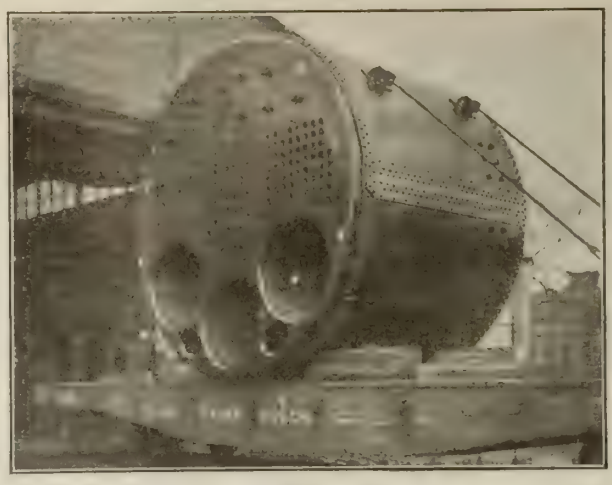
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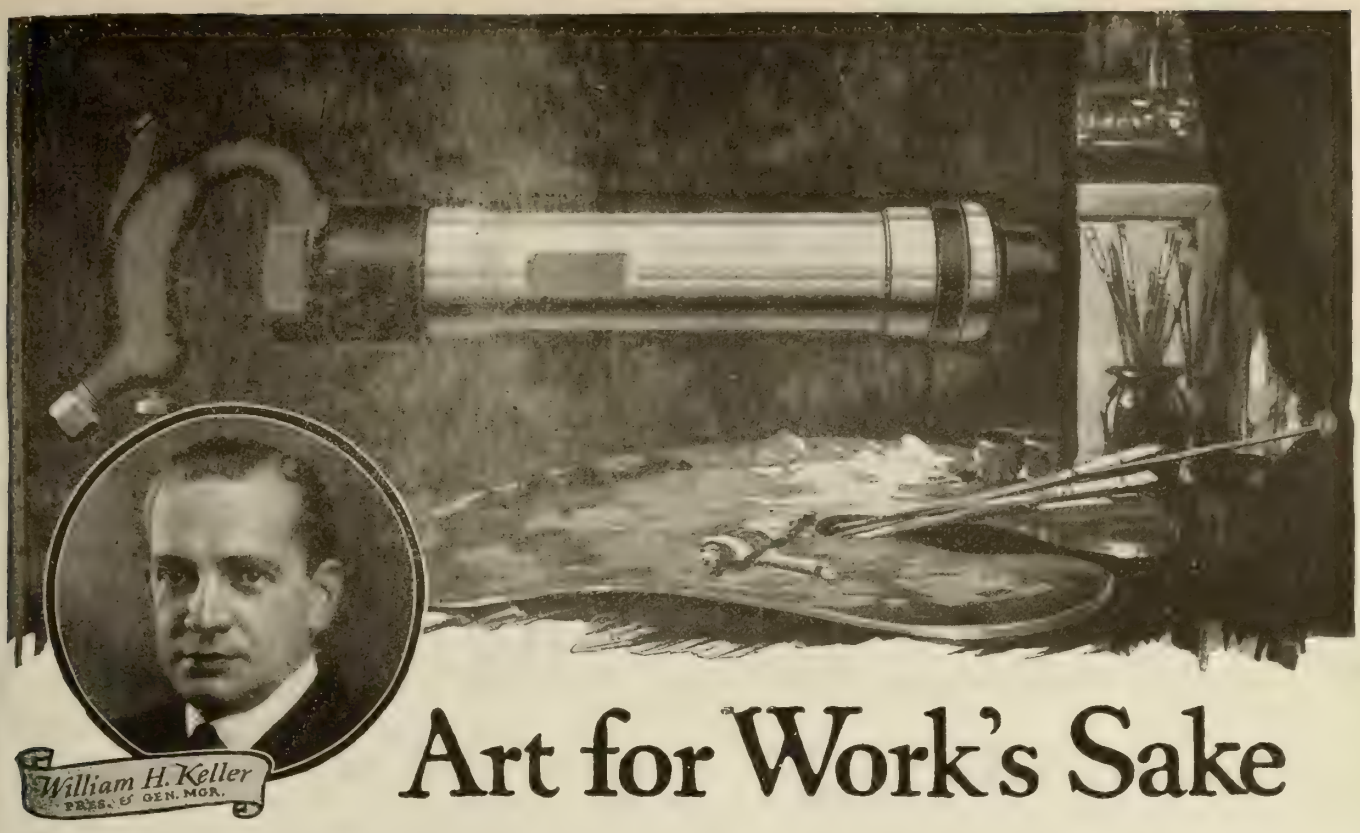
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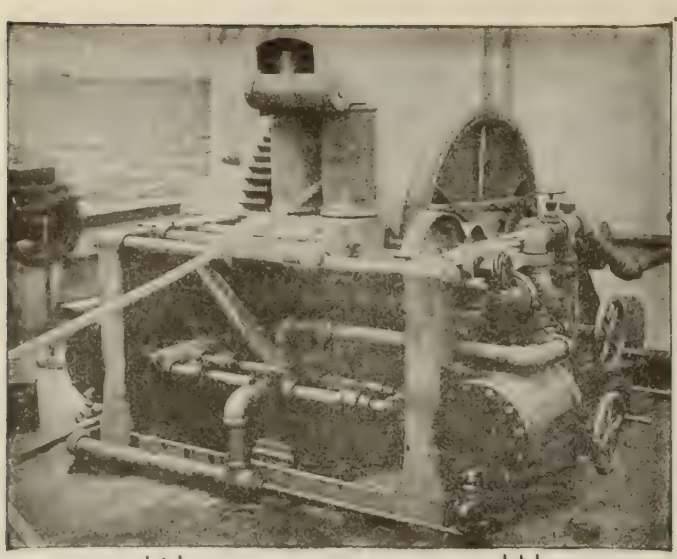
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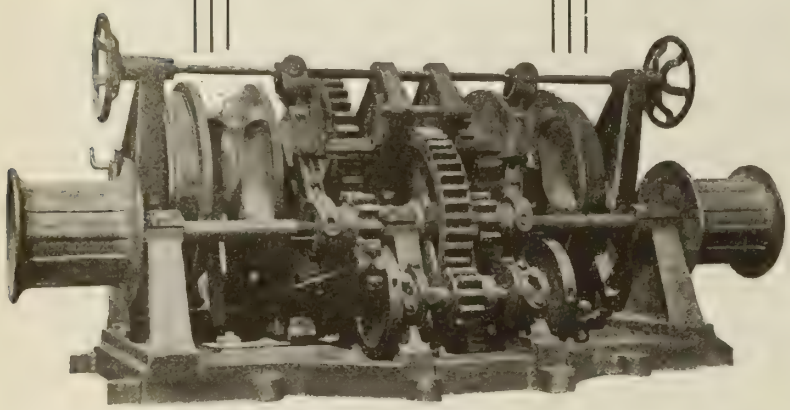
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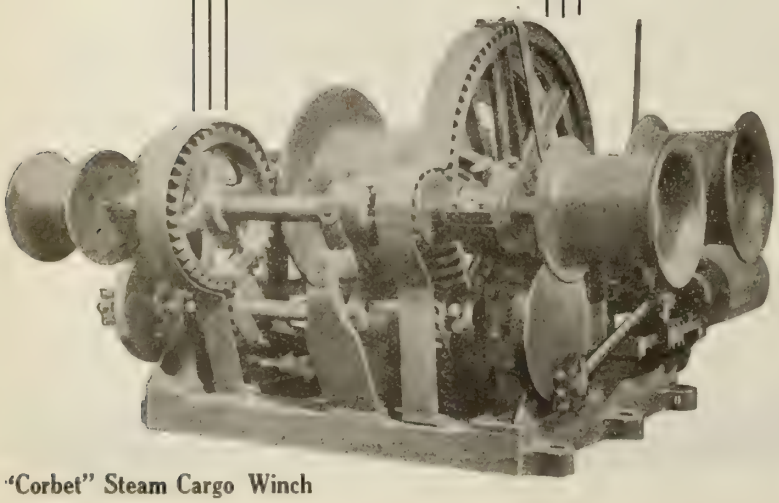


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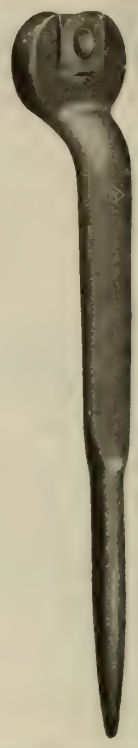


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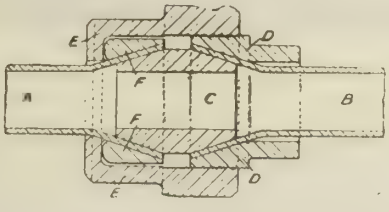
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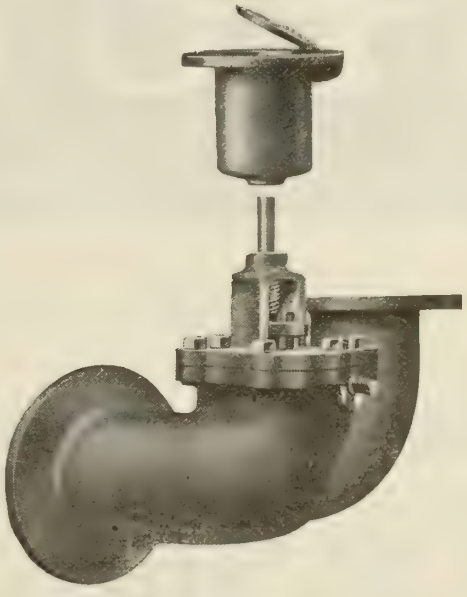


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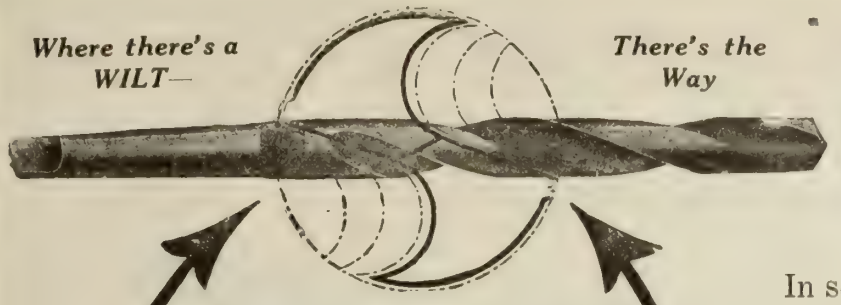
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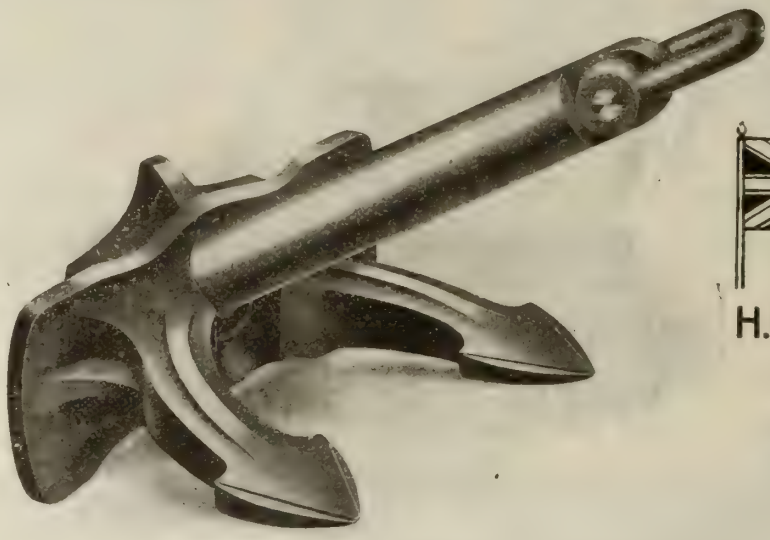
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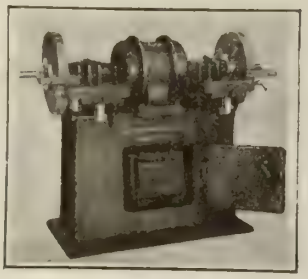
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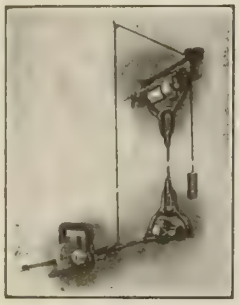
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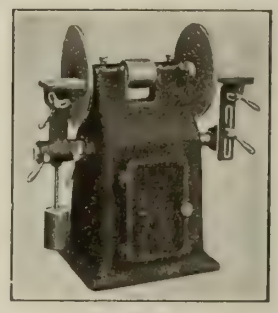
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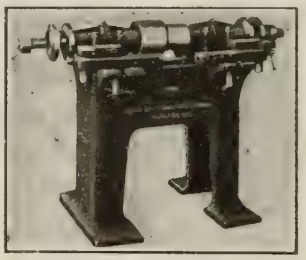


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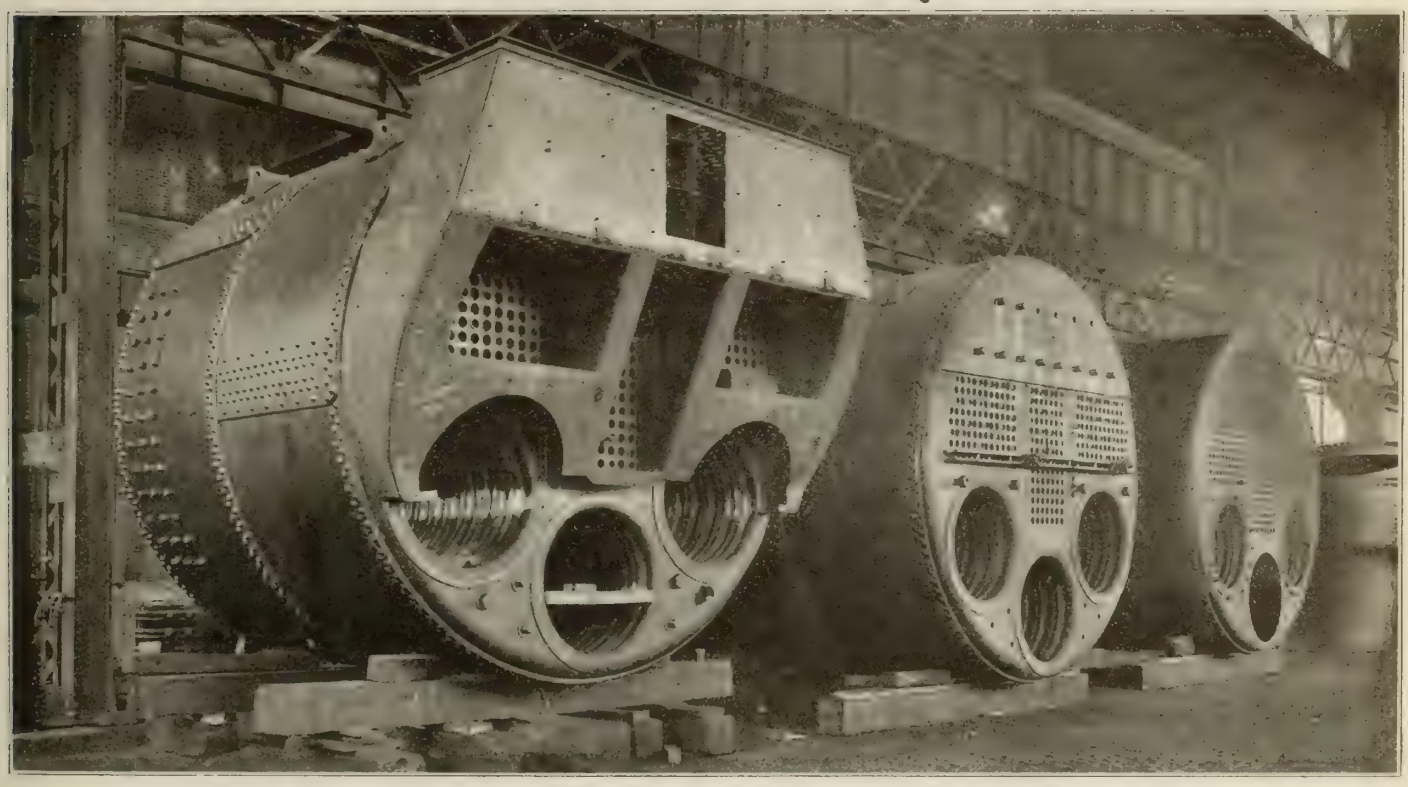
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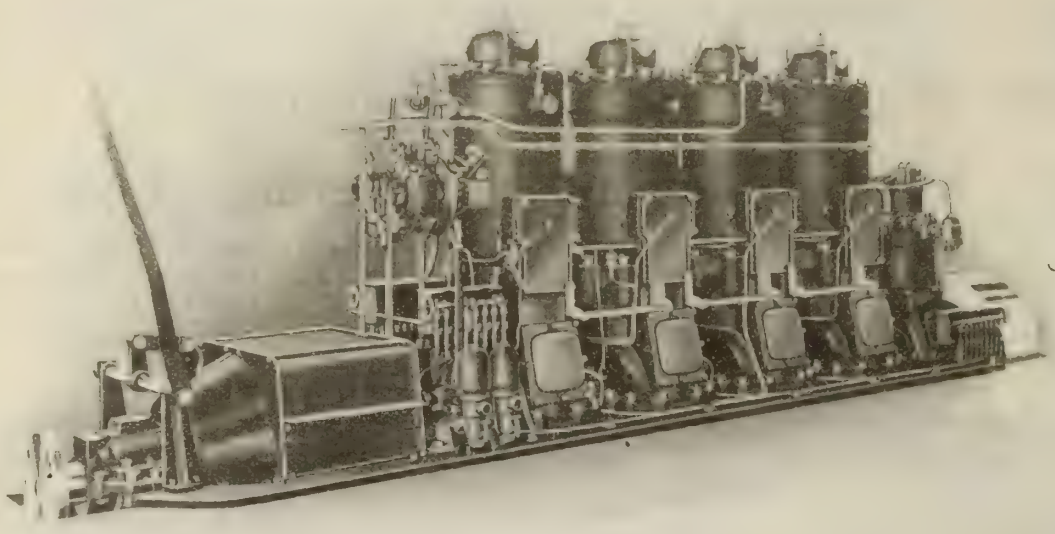
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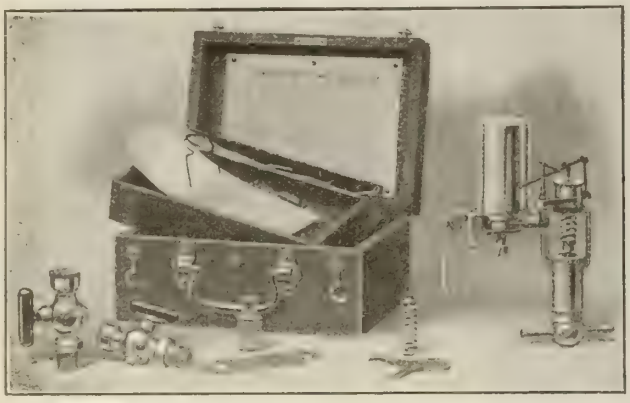
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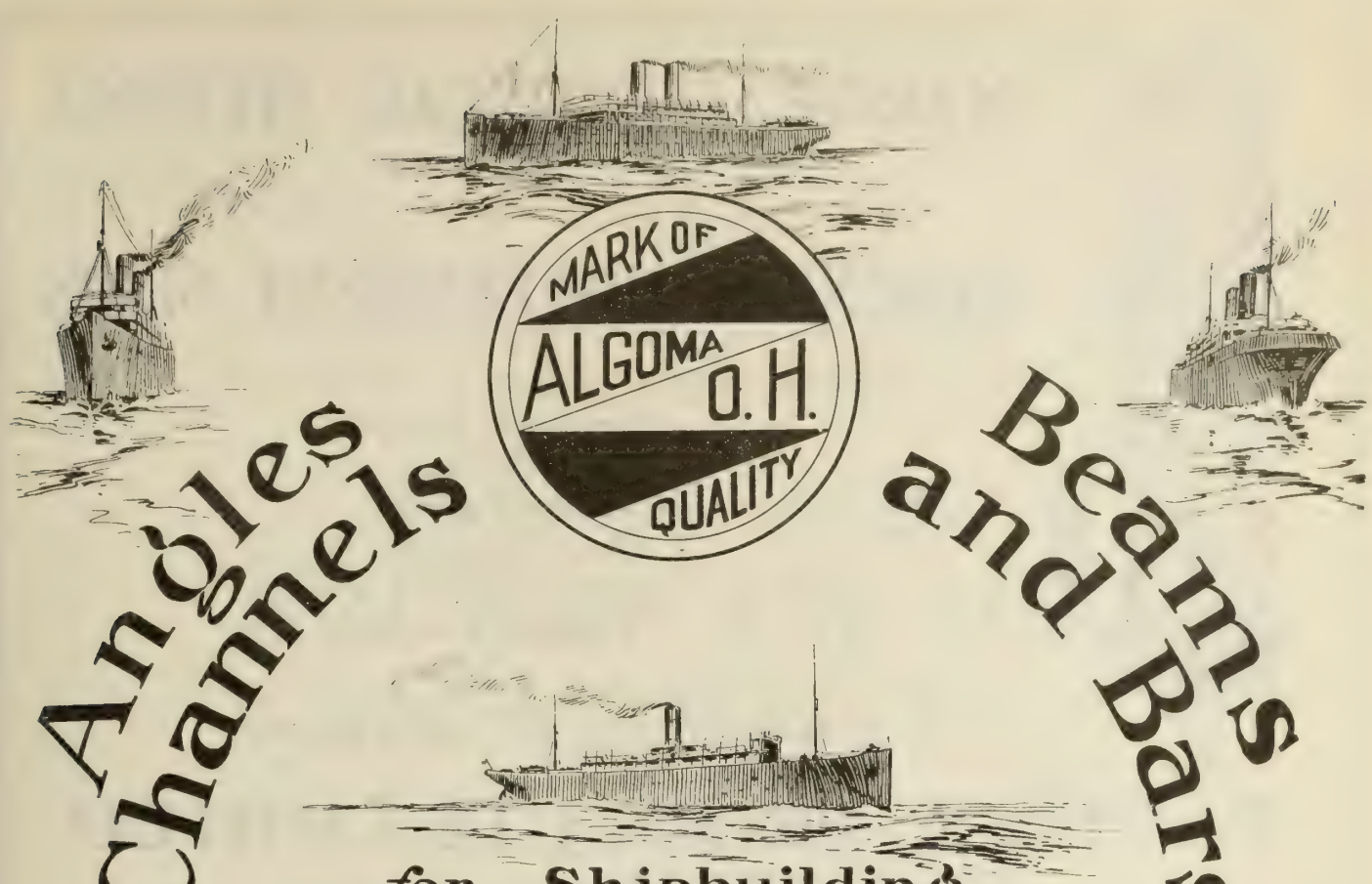
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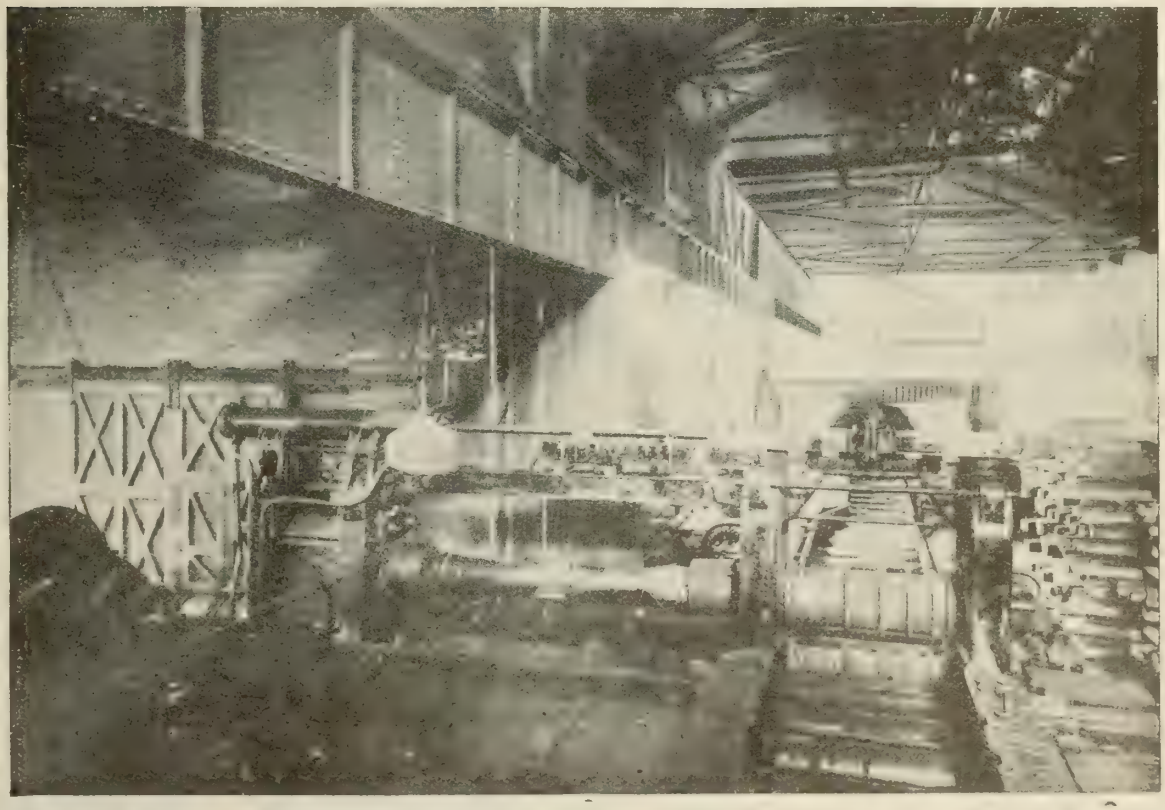
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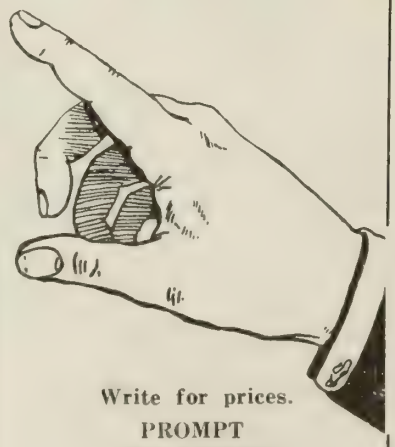
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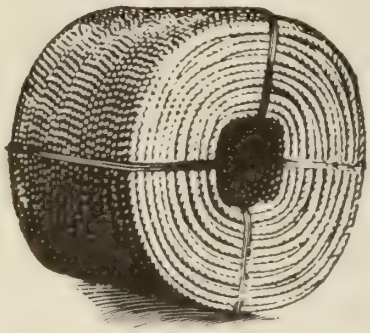
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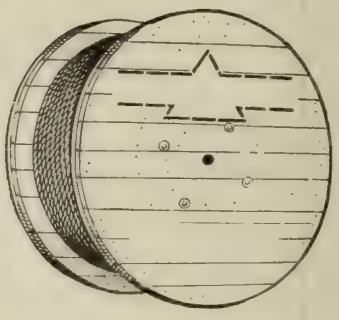
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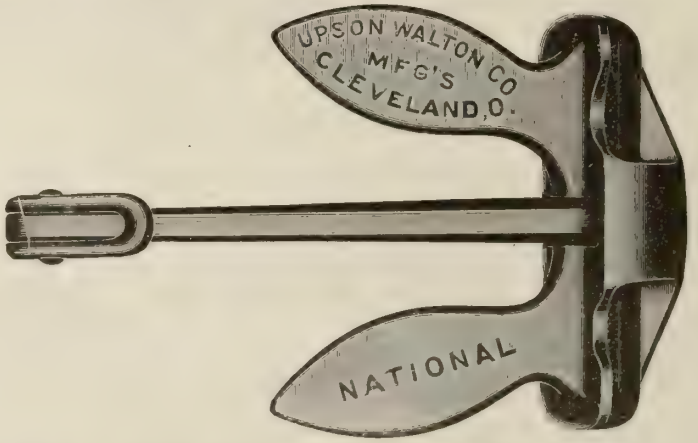






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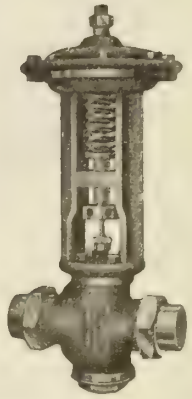
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Successors to H.L.Peiler & Company



The Best in Marine Specialties

Made-in-Canada By a Canadian Company



Mason No. 55 Style Pump Pressure Regulator

The **"Mason"** aim is to manufacture right here in Canada absolutely the best equipment that engineering knowledge and workmanship can produce. Men high up in engineering regard **Mason's** line of Marine Specialties as the last word in efficiency and economy. They are reliable, simple, and of proven quality and workmanship—possess distinctive features which are not duplicated in other designs.

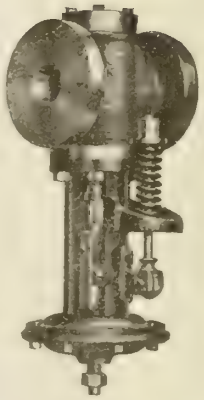


Reilly Marine Evaporator, Submerged Type

Sole Licensees and Distributors:

The Mason Regulator Co., Boston, Mass.; Nashua Machine Co., Nashua, N. H.; The Griscom-Russell Co., New York, N.Y.; Coppus Engineering and Equipment Co., Worcester, Mass.

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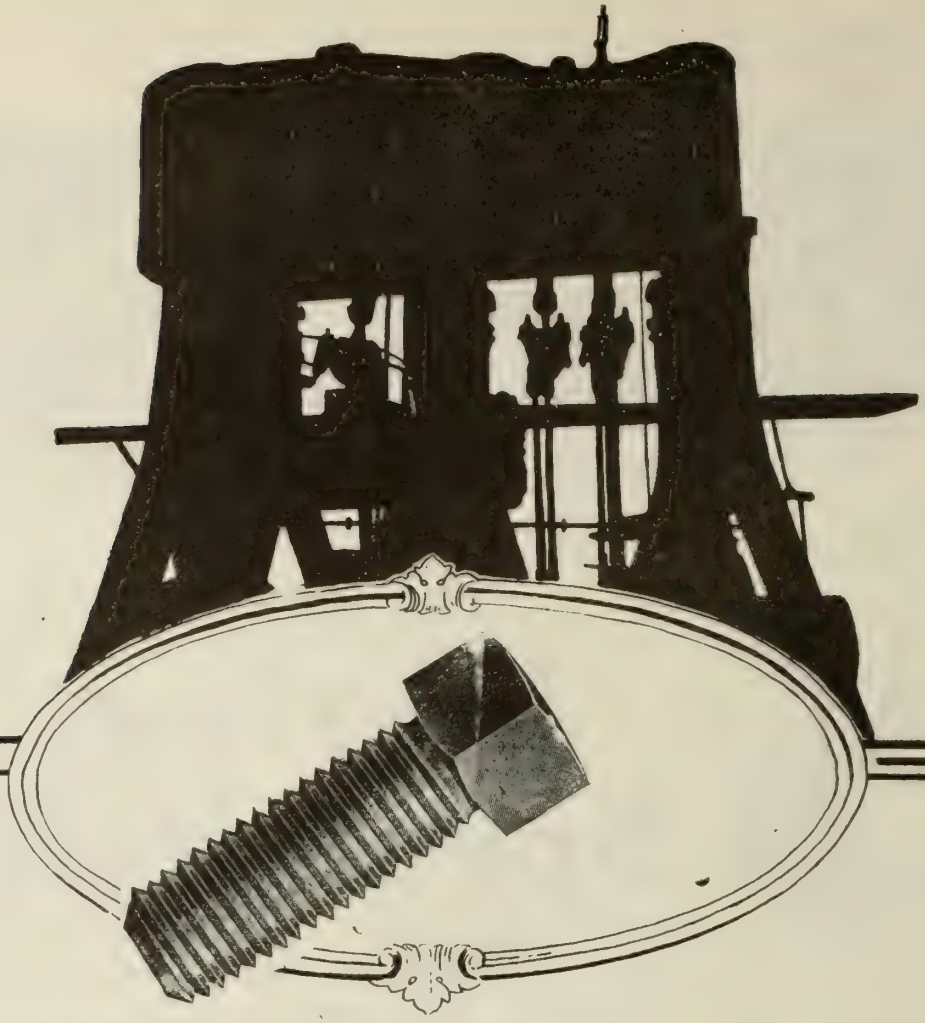
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Successors to H. L. PEILER & COMPANY

MONTREAL, Office and Factory, 135 to 153 DAGENAIS ST.

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The Last Word in Accuracy

Marine engine work demands a wide range of screw machine products. We have available for all such work the most accurate and rapid automatic machines built. Single spindle machines for a single spindle job. **RAPID FIRE** multiple spindle machines for multiple spindle jobs. When looking over your marine engine requirements just remember that nothing is too accurate and nothing too large for the GALT MACHINE SCREW CO., LIMITED. Spot delivery on standard products, such as Cap and Set Screws, Semi-finished Nuts, Studs and Taper Pins.

Galt Machine Screw Co., Limited

Galt, Ontario, Canada

Large stocks S.A.E. Plain and Castellated Nuts for prompt shipment.

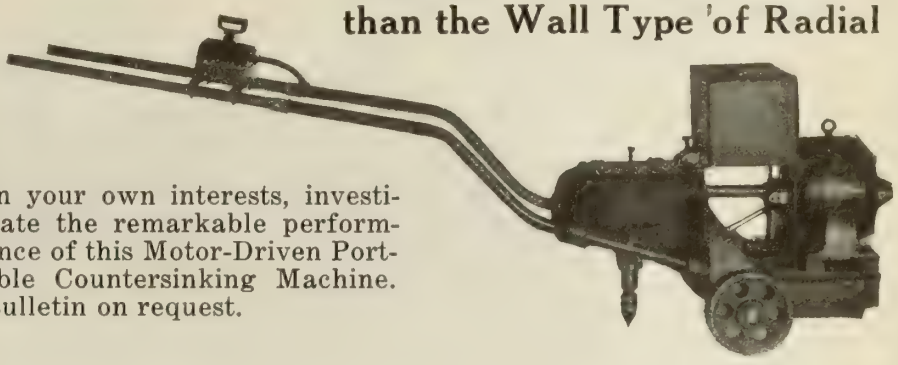
GALT SCREWS

Motor Driven Portable Countersinking Machine

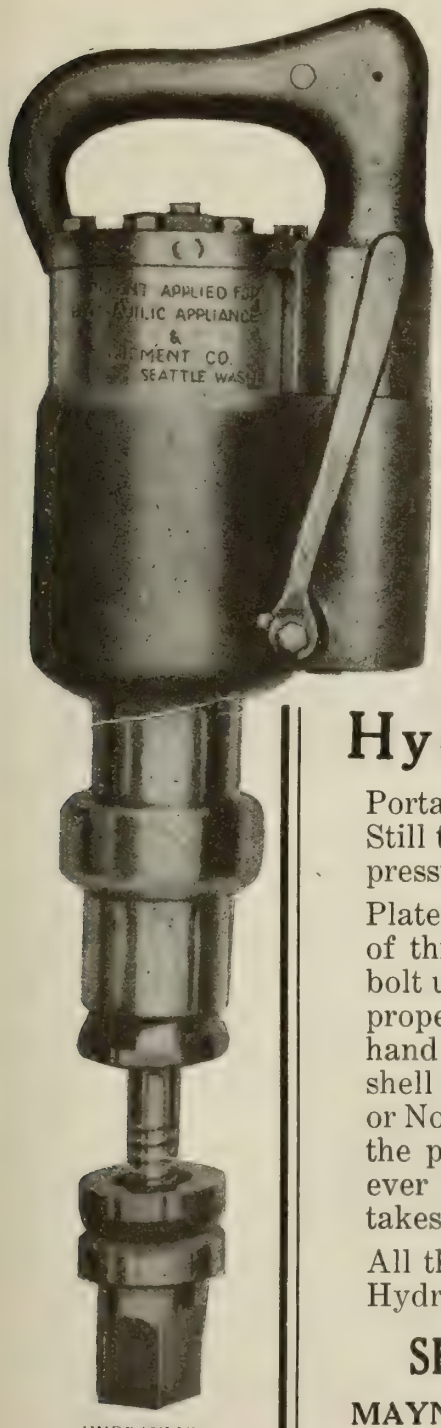
Operated by one man, this machine has a capacity three to four times greater than the wall type of radial. This is **proven** ability —in many of the largest shipyards and structural shops.

With this machine the plates are countersunk while on the floor. It eliminates the time and heavy labor heretofore required to carry the plates to the old type of wall machine. It saves shop room by taking the place of the wall type of radial, which so often interferes with overhead cranes and rigging. Bear in mind, too—

Capacity 4 Times Greater than the Wall Type of Radial



In your own interests, investigate the remarkable performance of this Motor-Driven Portable Countersinking Machine. Bulletin on request.



HYDRAULIC PLATE TIGHTENER

2 Men or 20?

Twenty men the old way cannot do more than one man and a helper with this new invention. It takes all the spring out of the plates, this

McBRIDE

(PATENTED)

Hydraulic Shipplate Tightener

Portable: weighs but 58 pounds; measures but 22 inches over all. Still the No. 2 Tightener exerts 20-ton pressure; the No. 3, 60-ton pressure—**by one stroke of the hand.**

Plates to be bolted up are placed between two compensating nuts of this Plate Tightener. The piston rod, taking the place of a bolt used in the hand method of tightening, is slipped through the proper holes punched in either plate. The lever is worked by hand and forces oil down on the piston rod in the chamber or shell until a pressure of 20 or 60 tons (according to whether No. 2 or No. 3 is used) is exerted in drawing the plates together. When the plates are drawn together by hand, not all of the spring is ever entirely taken out of them. But this Tightener absolutely takes out all spring.

All the leading shipyards on the Pacific Coast have adopted this Hydraulic Ship-plate Tightener. **Ask us to send you Bulletin.**

SHIPBUILDERS MACHINERY COMPANY, INC.

MAYNARD BUILDING SEATTLE, WASH.

Port Arthur Shipbuilding Company, Ltd.

PORT ARTHUR, ONTARIO, CANADA

Designers and Builders

Steel Ships, Engines, Boilers, Etc.

Noronic

Leaving plant of Port Arthur Shipbuilding Company, Ltd., on completion, May, 1914.



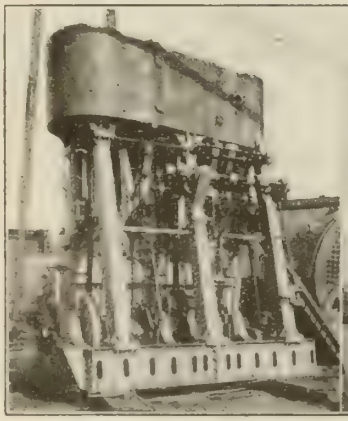
Passenger and Freight Steamer

Length Overall 385 ft.

Breadth Moulded 52 ft.

Depth Moulded 28 ft. 9 in.

Gross Tons 6,905



1500 H.P. Engine, Triple Expansion



Fourteen of these Trawlers for Dept. of Naval Service



Wheel Casting 14 ft. 9 in diameter

W. Grant Morden

coaling at C. N. R. Coal Docks, Port Arthur.

Built at Port Arthur Ship building Company, Ltd. Year 1914.



Bulk Freighter

Length Overall 625 ft.

Breadth Moulded 59 ft.

Depth Moulded 32 ft.

Gross Tons 8,973

The above are some of the products of our plant

We are also fully equipped with every modern facility for

REPAIR WORK

DRY DOCK 700' x 93' x 16'
Four Building Berths

General Offices and Plant:
PORT ARTHUR, ONTARIO

MARINE ENGINEERING
of Canada

Volume IX. TORONTO, MARCH, 1919 Number 3

Canadian Vickers Have Well-Equipped Plant

Industry on Banks of St. Lawrence Has Grown Apace—Have Large Amount of Work on Hand—Closed-in Berths Defy Winter Weather—Turned Out Record Number of Boilers in 1918

THE first impression gained by a visitor to the plant of Canadian Vickers, Limited, is one of solidity and permanency. The handsome office building, standing away from the shops and yards, with its spacious entrance hall and uniformed attendants, conveys a feeling at once that here is no mushroom growth, and this impression is further confirmed when one goes through the various departments.

The crying necessity for an adequate dry-dock on the St. Lawrence led to the negotiations that culminated in the arrival of the "Duke of Connaught" floating dock from Barrow-in-Furness in the fall of 1912. From the date of its arrival, the yard of which it was the nucleus commenced to grow, until today it is the largest and best-equipped shipbuilding plant in Canada. It covers a space of over 45 acres, and comprises heating station, electrical shop, power station, mold loft, plate shops, engine and boiler shops, mechanics' shop, deck machinery shop, pattern shop, joiners' shop, cabinet makers' shop, upholstery department, sail and riggers' lofts, and the building berths.

In addition to these is the large basin where the dry-dock has its place and where the newly-launched ships are fitted out. This basin has an extent of nearly twelve acres and has a uniform depth at low water of 30 feet. In the centre of this basin is the sinking basin into which the dry-dock is lowered when taking on or discharging a vessel. The extreme depth of this portion is about 50 feet. The floating dry-dock, which has its permanent place in the main basin, is built entirely of steel, and in three sections, any of which can be operated separately or jointly as desired. Each section is 200 feet long, with a width on the pontoon deck of 100 feet. The maximum capacity of the dock is 25,000 tons, and length of keel blocks 600 feet.

Along either side of the basin are large concrete walls, 28 feet high above the low-water level. The walls are 1,000 feet in length. Standard lines of railroad tracks connect this portion of the yard with all other departments of the works and the main railway line.

The yard is equipped with special defence lighting which can be switched on at a moment's notice from the watchman's office. A special squad of uniformed police is constantly on duty.

Entering the main shop from the west end, the plumbers and sheet metal workers are found. These departments are located one on either side of the tracks running down the centre of the shops. The plumbers' shops are devoted to the handling of iron and lead pipes for sanitary and heating purposes. The usual threading and cutting machines are in evidence. The sheet metal workers and tinsmiths on the other side of the aisle are employed in the making of ventilators, air ducts, wind chutes, and all the small galvanized iron work that is so much in evidence on board ships.

Plate and Angle Shops

Passing beyond these activities one reaches the plate shop proper at the far end of which can be seen the building berths themselves.

Most of the heavy machinery in this shop is of British manufacture and includes many powerful electrically-driven punching and shearing machines equipped with self-contained cranes, plate-planing machines for the longest plates rolled, double-headed scarphing machine and straightening and bending rolls of various sizes. Separate machines are also used for cutting, bending, straightening and bevelling angles.

There are also installed in this shop a number of hydraulically operated machines for keel plate bending, plate and angle joggling, flanging, and all kinds of pressed work.

Electric jib cranes of the swinging wall type with travelling trolley on the arm are used for serving the material to the heavier machines.

The capacity of some of these machines will give an idea of the dimensions of plates in frequent use in modern shipbuilding. A three-sided machine by Smith Bros., Glasgow, will punch 1¾ in. holes in 1¾ in. plate, shear steel ship plates in 1¾ in. plate and punch large manholes in ¾ in. plate. A hydraulic plate-flanging machine, by Hugh Smith & Co., Ltd., Glasgow, will cold flange keel plates 30 feet long in one operation. The large set of plate-bending rolls by the same makers will bend plates 36 ft. long by 2 in. thick. This machine is operated by one 200 B.h.p. and two 45 B.h.p. motors, and weighs about 260 tons.

In different parts of the plate shop several wall drills are in evidence. At the end of the shop nearest to the building berths are located the plate and angle furnaces, with their accompanying bending slabs. These furnaces, fired by producer gas, are of ample size to handle any plate in use. Close to the bending slabs one sees the now usual oxy-acetylene outfit, which is utilized for cutting and trimming plates and shapes and other purposes for which it is so well adapted. The blacksmith shop is also housed in this building so that practically all the hull work is performed under one roof.

The Berths

The raw material coming from the storage yards has a straight passage through the shops where it undergoes the various processes to fit it for its different uses, to the building berths. The berths are virtually a continuation of the shops, and there are five of them. The Canadian winter can do its worst here without interfering in the least with the progress of the work. The berths are completely enclosed, being not only roofed over, but having closed sides and ends. This ensures that, whatever the outside temperature may be, the men working on the hulls are adequately protected and can work in a comfortable atmosphere. Overhead cranes run the complete length of each berth to handle the material as it is built in. The berths are, of course, arranged for end launching.

There are at present five ships on the ways. These are in the following stages of completion:

No. 68.—8,100-ton cargo vessel for Canadian Government, ready for launching.

No. 69.—8,100-ton cargo vessel for Canadian Government, half plated.

No. 70.—8,100-ton cargo vessel for Canadian Government, frames erected.

No. 73.—4,450-ton cargo vessel for

Canadian Government, bottom framing erected.

No. 76.—8,300-ton cargo vessel for French interests, bottom framing erected.

The output from this yard last year comprised the following:

Six cargo vessels, each of over 7,000 tons deadweight; one cargo vessel of 8,100 tons deadweight; one cargo vessel, 4,350 tons deadweight.

The Joiners' Shop

Leaving the plate shop and the berths, the joiners' shop is the next to be visited. Furniture for the officers' and engineers' rooms, captain's room, chart room, bridge and accommodation ladders, boat chocks, etc., are all being turned out by skilled men. On the second floor is that most important department of a shipyard, the mold loft, where the whole of the ship is laid off in wooden templates. These are built up from the blue prints and then taken down to the shops, where the shapes are transferred to the plates, and the plates sheared and punched accordingly. Although this department occupies but a small space its influence permeates the entire activities of the plant.

The Engine and Boiler Shops

The engine and boiler-building shops occupy all the north side of the fitting-out basin. They are enclosed in a building 540 ft. by 155 ft.

The boiler shop is fitted out to handle boilers with speed and certainty. Last year they turned out an average of one boiler a week, and these were not confined to one type, water-tube being made as well as Scotch boilers. There were, at one end of the shop at the time of writing, six boilers in various stages of erection, these being 15 feet 8 inches diameter by 11 feet 6 inches long, with three corrugated furnaces 46 inches in diameter. The shell plates for these boilers are 1⅜ in. in thickness, and naturally require heavy machinery for their formation into the finished boiler. Two twenty-five-ton travelling cranes are installed for moving the different parts about the shop. The machines are mostly of the hydraulic type for the forming processes, such as bending, flanging, and riveting.

The plates are heated in oil-fired furnaces and the necessary flanging performed in a 150-ton hydraulic flanging machine. Shell plates are formed in a large vertical bending machine, made by Hugh Smith & Co., Glasgow. Contrary to the general practice of rolling to obtain the circle for the boiler shape, this machine performs its work by a succession of pressures while the plate is held in a fixed position, the plates being moved a little after each pressure has taken place. The machine can be operated at will or automatically as desired, and the movement can be obtained in either direction. On the heavy plates several reversals are necessary before the desired operation is completed, especially when the arc to be made is small and the plates extremely thick. This machine has a capacity for plates about 12 ft. 6 inches wide and 1½ in. thick.

A 150-ton hydraulic riveting machine is used for riveting. For drilling staybolt holes in back head and combustion chamber the boilers are mounted on rollers and the drilling done by a horizontal drill, the carriage having a vertical and horizontal travel. When all the holes within the travel of the machine are drilled the boiler is turned around bodily on the rollers to bring other holes in line. A long drill is used for drilling staybolt holes in shell and combustion chamber at one operation, ensuring perfect alignment. The edges of all plates and butt straps are accurately planed before being fitted, care being taken that all burrs are removed. One corner of the shop is devoted to the building up of smoke-boxes, casings and funnels.

From the boiler shop to the engine room is an easy transition. Here again one notes the heavy style of the machines in use, fitted for working the largest castings and forgings. In the corner of the shop given over to erection are four large triple-expansion engines for the vessels now under construction. These engines are of 3,000 i.h.p., and the cylinders are 27 x 44 x 73 ins. by 48 ins. stroke. The reversing gear is of the all-round type, which is thought by many sea-going engineers to be much more convenient than the straight ram balanced cylinder style. The pumps are mounted on the back of the h.p. column. The finished engine is a pleasing sight. Among the heavy machines one notices a large shafting lathe with a long bed, fitted with two heads and two tailstocks with double saddles between each, this machine was made by Hulse & Co., of Manchester; a large crank shaft lathe by Thos. Shanks & Co., Johnstone. Scotland; a vertical and horizontal planing



THE SHIP BERTHS AND BASIN



THE DRY DOCK WITH OCEAN STEAMER

machine for machining the feet and heads of cylinder columns, by Hulse & Co., and a horizontal boring machine by Thos. Shanks & Co., of patent design for extreme accuracy in boring of cylinders and turbine casings. There are a large number of smaller machines, too numerous to mention here, but the whole make a very complete outfit. Cranks, intermediate, thrust and tail shafts at different points of their progress, from the rough to the finished article dot the floor. Here one sees a propeller boss being bored, and close by the flanges of the blades are going through the same process. Near this again is a propeller being assembled. A crank shaft is in the lathe being turned up, while two more are being set up on blocks and the couplings bolted together. It is a fascinating place and one leaves it with regret. Any one of these shops would be a fit subject for a detailed article.

The Deck Machinery Shop

Near the main gate is a long and narrow building which was at one time devoted to the manufacture of munitions. Happily the need for that has gone by and it is now employed for the manufacture of deck machinery. Here are made all the steam and hand stearing gears, safety steering telemotors, winches, windlasses, ash hoists, etc., for the ships built by the Canadian Vickers and for vessels built by other firms also. These machines are built under license from the best British makers.

The details incorporated in the designs of this deck machinery to resist the hard usage encountered are numerous. They are the result of long experience in the British mercantile marine, the success of a ship in operation being largely dependent on satisfactory service from its deck machinery.

One of the principal features in connection with the operation of this plant is the extensive use of hydraulic machines for accomplishing many of the forming and bending details on the plates and shapes.

Weather conditions in Canada are not particularly favorable for the successful maintenance of such equipment, as the ordinary shipyard berths are difficult to heat during the severe cold weather. Destruction of hydraulic appliances through the agency of frost must be carefully guarded against, especially in northern climates, where the possibilities of freezing are much greater, owing to the frequent and often sudden changes in temperature and climatic conditions. This plant has experienced no difficulty in this respect, due largely to the efficient piping installations and its method of delivery from the pumps in the engine room to the various departments. All the piping is carried underground, being located in a spacious tunnel, the top of which is almost six feet below the surface of the ground. This tunnel also contains all electrical conduits, water and steam pipes, etc., all of which assists in maintaining a uniform temperature that prevents the liability of frost. This tunnel has a total length of about 3,000 feet.

Safety First

A "safety first" campaign has been inaugurated and shop safety committees formed in each department for the purpose of recommending methods making for the reduction of the possibility of accidents.

First Aid Hospital

A thoroughly equipped hospital is installed in the plant where all accidents, whether minor or otherwise, receive immediate attention. Three first aid men are employed, two for day work and one for night work.

Employment of Returned Men

A bureau has been erected solely for the purpose of dealing with this difficult matter, which is in charge of a returned soldier and a committee of returned soldiers, formed of returned men in their works, has been elected. The company recognizes the right of returned men to the fullest possible consideration with regard to employment, and is giving them this consideration. Over 10 per cent. of the total employees are returned men.



PART OF THE JOINERS' SHOP

Fire-Fighting Facilities

An efficient fire brigade has been instituted, recruited from the men employed—the standard of efficiency being kept up by frequent fire drills.

Athletic Activities

Having an earnest desire to improve social conditions of its workmen, this company has always readily supported, financially or otherwise, the various athletic clubs formed by the men, and has further invited the men to band together and form a football league. This league is now in existence and the clubs representing the various departments compete for a shield given by the company. The providing of a sports ground is also receiving the attention of the management.

Work Carried Out by Canadian Vickers, Ltd., Since Operations Commenced

One icebreaker for the Russian Government: Length between perpendiculars, 275 feet; breadth molded, 57 ft. 6 ins.; depth molded, 20 ft. 6 ins.

One twin-screw combined hopper and barge-loading dredge for Canadian Government: Length between perpendiculars, 284 ft.; breadth molded, 48 ft.; depth molded, 20 ft. 6 ins.

Twenty-four submarines for British and Allied Governments.

Two hundred and fourteen motor-boats for the British Government.

Six mine-sweeping trawlers for Department of Naval Service: Length between perpendiculars, 130 feet; breadth molded, 25 ft.; depth molded, 14 ft. 3 ins.

Eleven mine-sweeping trawlers for Director of Naval Service: Length between perpendiculars, 125 feet; breadth molded, 23 ft. 4 ins.; depth molded, 13 ft. 6 ins.

Twenty-six mine-sweeping drifters for Director of Naval Service: Length between perpendiculars, 84 ft.; breadth molded, 19 ft. 3 in.; depth molded, 10 ft. 11½ ins.

One single deck cargo vessel, "Porsanger" for Norwegian interests: Deadweight carrying capacity, 7,263 tons; length between perpendiculars, 380 ft.; breadth molded, 49 ft.; depth molded, 30 ft.

One single deck cargo vessel "Samnanger" for Norwegian interests: Deadweight carrying capacity, 7,359 tons; length between perpendiculars, 380 ft.; breadth molded, 49 ft.; depth molded, 30 ft.

Four single deck cargo vessels for Ministry of Shipping: Length between perpendiculars, 380 ft.; breadth molded, 49 ft.; depth molded, 30 ft.; the deadweight carrying capacity of these vessels being: "War Earl," 7,211 tons; "War Duchess," 7,278 tons; "War Faith," 7,263 tons; "War Joy," 7,267 tons.

One single deck cargo vessel, "Canadian Pioneer," for Canadian Government: Deadweight carrying capacity, approximately, 8,100 tons; length between perpendiculars, 400 ft.; breadth molded, 52 ft.; depth molded, 31 ft.

One single deck cargo vessel, "Canadian Voyageur," for Canadian Government: Deadweight carrying capacity, approximately 4,350 tons; Length between perpendiculars, 320 ft.; breadth molded, 44 ft.; depth molded, 25 ft.

Engines and boilers were built for eight of the above trawlers and for all of the above cargo vessels.

In addition, twenty-eight water-tube boilers were built to the order of the Imperial Munitions Board.

The deck machinery for all the above cargo vessels was also built in these works in addition to a large number of machines for outside parties.

Four pulp digesters, the largest ever built on this continent, were constructed in these works and erected at the Ha! Ha! Bay Sulphite Company's plant.

A considerable amount of repair work has been carried out including work on several of H.M. cruisers.

Contracts for shells were also executed, the total number of shells turned out being 1,365,860 of various sizes.

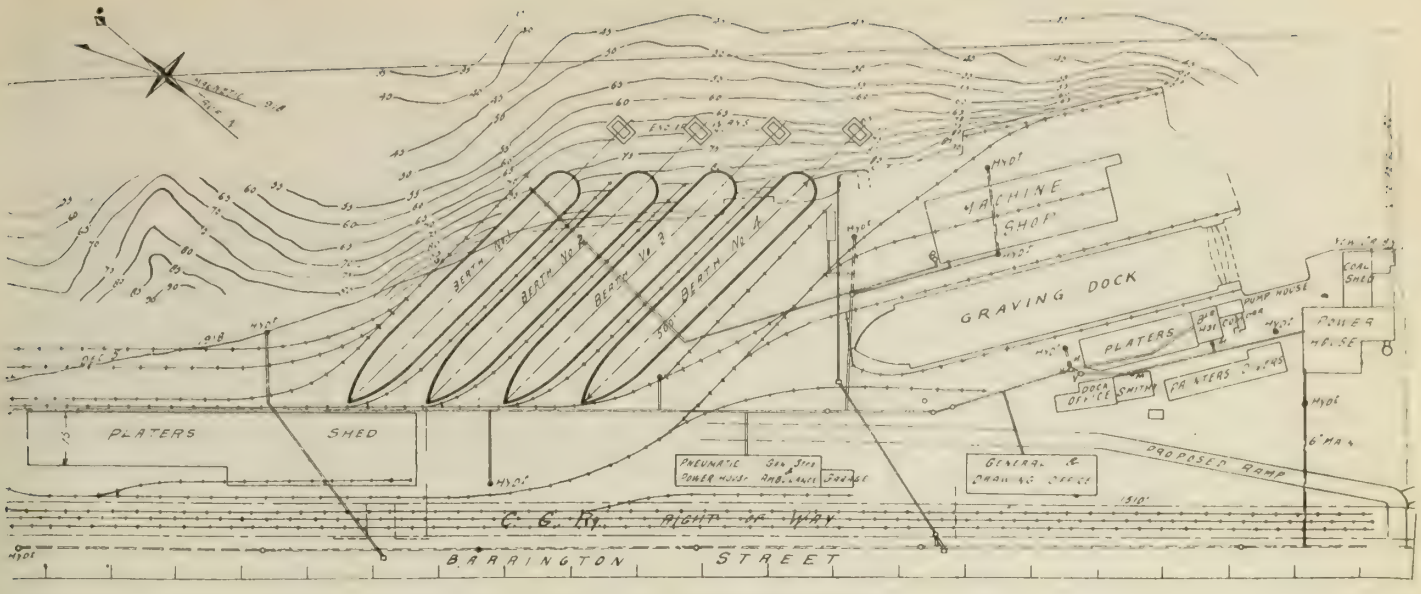
Shipbuilding contracts on hand at the present time comprise five 8,100-ton, and one 4,450-ton cargo vessels for the Canadian Government, and one 8,300-ton cargo vessel for French interests.

Training of Men

For the purpose of educating men in the different departments, weekly lec-



LOOKING DOWN THE PLATE SHOP



LAYOUT OF HALIFAX SHIPYARD.

Halifax Shipyards Embraces Old and New Industry

New Plant Rising on Site of Building Destroyed by Explosion—Owns Large Graving Dock and Deep Water Wharf—Also Marine Railway—Has Contracts From Canadian Government For Four Ships

RISING from the site where stood the Halifax Sugar Refinery before the great disaster of December, 1917, is an industry that the people of Halifax hope will become a permanent feature in their midst. A huge plant for building steel ships is in course of construction, and considerable progress has been already made. The new concern is known as the Halifax Shipyards, and besides the construction of new tonnage a large repair business has been included.

The Dry Dock and Wharf

The company have taken over the old Halifax Graving Dock and all the property contained therein, and have been doing a large business on repairing ships since June, 1918. The graving dock adjoins His Majesty's dockyard, and the company also owns a large wharf for berthing vessels not requiring to be dry-docked. Large machine shops are being constructed, and the management are endeavoring to maintain a plant and personnel capable of carrying out any repairs that may be required on any vessel coming into the harbor. The work already carried out is remarkable in its scope and intensity, as can be seen from the list given here. The general arrangement gives a good idea of the extent of the property and the projected shops.

There are at the present time four ships undergoing alterations or repairs at the company's dock. In the graving dock are two vessels, one of them the "Montcalm," belonging to the Canadian Government, undergoing a general overhaul, and the "War Fiend," one of the Canadian-built 3,500-ton freighters. The "War Fiend" is in for cleaning and painting. The dock is 567 feet long overall, by 89 feet 6 inches in width, with a total depth of 34 feet 8½ inches. Over the top of the blocks the depth is 27 feet, so that a very large-sized vessel can be comfortably taken in. The largest vessel docked so far was H.M.S. Leviathan, of 14.500 tons displacement.



THE BUILDING WAYS.

Lying at the wharves are two steamers of very different types. One of them is the old Canadian Pacific Ocean Service steamer, "Lake Manitoba." This vessel, it will be remembered, recently underwent a most disastrous fire in Montreal. She was brought round to Halifax, where she is being practically rebuilt, and all the passenger accommodation is being removed. She will be, when completed, a first-class cargo steamer. Practically all the interior has to be taken out of her. Her hull presents a mass of twisted plates, frames, beams, and stringers, as they were warped and bent by the intense heat. These have all to be removed, and where not too badly damaged, straightened out and refitted, and in many cases completely renewed.

Lying just ahead of the "Lake Manitoba" is the lake type freighter "Mariska." This vessel is being altered and refitted to make her an ocean-

VESSELS IN DOCK AND AT DOCK PIER
From June 24th, 1918, on

S.S. Northumberland	Wharfage dues—at wharf June 23rd to 25th.
Tug Eastern Passage	Repairs to boiler—at wharf June 26th to July 1st.
S.S. Picton	Repairs to hull—in dock May 2nd to June 27th.
Submarines (2)	General repairs—in dock May 2nd to June 27th.
S.S. Ed. Jeremac	Engine room repairs—in dock June 27th to July 2nd.
S.S. Pro Patria	Repairs to boilers—at wharf July 1st to 4th.
S.S. P. E. Island	Drawing stern tubes and tightening leaky rivets, etc.—at wharf July 2 to 25; in dock July 26 to Aug. 9.
N.S. Constr. Co. Scow	Dockage—in dock July 26th to Aug. 9th.
H.M.S. Leviathan	Repairs to bottom damage—in dock July 4 to 25.
S.S. Nevada	Furnace repairs—at wharf July 6 to 22.
S.S. San Jacinto	Temporary repairs to bow damage—at wharf July 25th to Aug. 16th.
S.S. Drummond	Repairs to bottom damage and general repairs to hull and machinery—in dock Aug. 10 to Nov. 13; at dock July 31 to Aug. 9.
S.S. Angouleme	Repairs bottom damage, overhauling machinery, etc.—in dock Aug. 10 to Nov. 13.
Tug Trusty	Repairs to boiler—at wharf Sept. 25 to 29.
Tug Cruiser	Repairs to boiler—at wharf Sept. 25 to 27.
S.S. McKee	Gun job—at wharf Sept. 28 to Oct. 3.
S.S. American	Moving spar deck; temporary repairs and boiler repairs according to Spec; making and supplying 1 pattern for hawse pipe, and cutting out 1,000 rivets—at wharf Nov. 2nd to Nov. 10th.
S.S. Margaret	Docking and repairing—in dock Nov. 13th to 22nd.
S.S. Scotia	Dockage—in dock Nov. 13th to 22nd.
S.S. Lake Manitoba	Repairs to hull and deck, engines, boilers, winches, steering gear, windlass and piping; temporary wiring for electric lights. At wharf Nov. 18th to .....
S.S. St. Julien) Messines) T.R. 24)	Dockage—scraping and painting—in dock Dec. 2nd to Dec. 6th.
S.S. Ypres) T. R. 1) T. R. 2)	Dockage—scraping and painting—in dock Dec. 6th to 11th.
S.S. Arleux) S.S. Arras) S.S. Thiepval)	Dockage—scraping and painting—in dock Dec. 11th to 14th.
S.S. Westerian	New mast and derricks and repairs as per Spec.—at wharf Dec. 14th to .....
S.S. Chaleur	General repairs, scraping and painting—in dock Dec. 15th to Dec. 18th.
Mackay-Bennett	Repairs to tank tops and boiler shell plates, and supplying and fitting sheathing plate, also painting, repairs to rudder and rudder pintals, and supplying and fitting 60' angle iron; pipefitters' work on seacocks, W.C. and valves; in dock Dec. 19th to Dec. 30th.
Tug Paint	Electric welding on boilers—at wharf Dec. 23rd.
War Quebec	Drydocking for examination—cut out holes in keel, fill up hole in planking in forepeak—caulk all butts under water—paint rudder and propeller—in dock Dec. 30, 1918, to Jan. 6, 1919.
S.S. Lansdowne	Drydocking for survey—in dock Jan. 6th to 9th.
T.R. 52) Givenchy)	Drydocking and painting—in dock Jan. 6th to 9th.
Beechland	Painting and repairs—in dock Jan. 13th to 16th.
Edgewood	Drydocking and painting—in dock Jan. 13th to 16th.
War Sorel	Bottom damage and painting—in dock Jan. 15th to 24th.
Prince Ito	New shoes, etc., and painting—in dock Jan. 15th to 24th.
Hennington Court	Scraping and painting—in dock Jan. 25th to Feb. 5th.
Murray Stewart	Scraping and painting—in dock Feb. 5th to Feb. 13th.
War Sioux	Scraping and painting and recaulking—in dock Feb. 5th to Feb. 13th.
Canadian Voyageur	Bow damage, painting and general overhauling—in dock Feb. 14th to Feb. 22nd.
Trawler "Loos"	Scraping and painting—in dock Feb. 14th to 22nd.
War Fiend	Shell damage and repairs to rudder—in dock Feb. 31st to .....
Montcalm	Repairs to rudder and propeller—in dock Feb. 21st to .....

going vessel, which necessitates very extensive rearrangements.

The repair work going on gives employment to 800 men of all trades, and this number will be more than doubled when the building work commences. Besides this plant the company owns and operates a marine railway at Dartmouth, on the other side of the harbor, which is kept working to capacity on the smaller-sized craft.

The Machine Shops

While the new shops are being constructed work is carried on in the old dry dock shop on the side of the dock nearest the street. The new shop is being built on the harbor side of the dry dock, and will be a thoroughly up-to-date and complete establishment. Most of the machinery for this shop is being imported from Scotland and England.

The shop which is at present in use has an equipment which is well able to deal with the class of work being undertaken. There are several sets of punches and shears, and a large set of plate rolls made by Smith Bros., of Glasgow, capable of handling plates up to 30 feet in length. There is also a set of smaller rolls, a battery of three radial drills, and a large double-headed shaper. There are also the usual plate and angle furnaces, with their bending slabs. The Canadian Government Railway tracks run into the yard, and there are three 15-ton locomotive cranes for handling material in the yard.

At the end of this shop is a boiler room containing four 100 h.p. horizontal return tubular boilers. These supply steam for power and heating, and also for the centrifugal pumps used for emptying the dry dock. These pumps are placed in a separate house at the end of the dock, and are set at the level of the bottom of the dock so that they have no lift to overcome when pumping.

The New Power House

A large part of the power used is now obtained from the lines of the Halifax Street Railway, but the limit of their capacity has been reached. A power house is being erected as shown in the plan, at the far end of the premises, abutting on the Government Dockyard. Provision is being made here for a battery of eight Babcock and Wilcox water-tube boilers of 500 h.p. each. These will supply steam to three turbo generators of about 1,200 h.p. each, which will supply power and light for the whole yard. A Webber system concrete smokestack will handle the flue gases, the stack being about 180 feet from the base to the coping.

The New Machine Shop

The new machine shop will be in a position to receive work both from the dry dock and the wharf. It will stand right between the two, and a track will run on each side of it. One end of the shop has been reserved for the air compressors, and this has been already installed. Some of the tools have arrived



"CANADIAN VOYAGEUR" IN DRY DOCKS



VIEW OF SHIPYARD.

LIST OF BOATS DOCKED ON DARTMOUTH MARINE SLIP

	Hauled	Launched
S.S. Arcadia (Hendry, Ltd.)	Dec. 11	Dec. 13
(Repairs to rudder, rudder shoe and syphon done by Halifax Shipyards, Ltd.)		
H.M.C.S. Canso (Dept. Naval Ser.)	" 12	" 19
(Scraping and painting done by Halifax Shipyards.)		
(Repairs to hull being done by Dockyard men.)		
S.S. Shannon (Beasley Bros.)	" 13	" 14
(Stopping leak—ship carpenter work being done by Geo. H. Young.)		
S.S. Amanda (Pickford & Black, Agents)	" 14	" 22
(Scraping and painting done by Halifax Shipyards.)		
(Taking in tail end, new lignum vitæ bushing made for bottom of bearing, new propeller put on, new rudder pintle made—repairs to donkey boiler.)		
Earl Grey (A. M. Smith)	" 16	" 18
(Scraping and painting done by Halifax Shipyards.)		
Richard Linthicum (Hendry, Ltd.)	" 20	" 21
(On for survey.)		
S.S. Springhill (Dominion Coal Co.)	" 23	Jan. 18
(Repairs to hull and engines, scraping and painting being done by Halifax Shipyards.)		
(Wood work being done by G. H. Young.)		
S.S. Sarnia City (Mar. Wreck. & Salv. Co.)	" 24	" 29
(Repairs to engines, boilers and hull being done by Halifax Shipyards, Ltd.)		
Motor Boat Kimoes (Capt. Sharp)	" 26	Dec. 31
(Scraping and painting done by Halifax Shipyards.)		
(Small tail end job, being done by himself with our permission.)		
S.S. Arcadia (Hendry, Ltd.)	" 26	Jan. 18
(Tail end job being done by Halifax Shipyards.)		
Schr. Silver Thread (W. N. Reinhardt)	" 31	Jan. 6
(Scraping and painting being done by us.)		
S.S. Alfreda (Dept. Naval Service)	Jan. 7	Jan. 29
(Work being done by A. A. Webber, E. F. Williams and Dockyard.)		
W. H. Lee (Dept. of Naval Service)	" 13	" 20
(Repairs to hull, caulking and scraping and painting done by Dockyard.)		
Lighter Pastime (J. C. Calnen)	" 18	" 27
(Caulking done by G. H. Young.)		
(Scraping and painting done by us.)		
Schr. Sarah (Sebastian Soares Roberie)	" 20	" 29
(Repairs to hull being done by G. H. Young.)		
No. 1 Pilot Boat America (Supt. of Pilots, Halifax)	" 27	" 31
(Scraping and painting, and repairs to engines done by us.)		
S.S. Rosemary (Neville Canneries, Ltd.)	" 27	Feb. 3
(Painted and hull repairs done by us.)		
H.M.C.S. Armentieres (Dept. Naval Ser.)	" 30	" 14
(Scraping and painting done by us.)		
(Hull repairs being done by Dockyard men.)		
Schr. Flavilla (A. E. Curran & Co.)	Feb. 3	" 8
(Scraped and painted by us.)		
(Repairs to hull being done by G. H. Young).		
S.S. Arcadia (Hendry, Ltd.)	" 3	" 8
(Repairs to hull done by G. H. Young.)		
(Repairs to engines done by us.)		
S.S. Pluvia (Hendry, Ltd.)	" 8	" 11
(Repairs to engines done by us.)		
(Repairs to hull done by G. H. Young.)		
Pilot Boat No. 2—"Columbia" (Supt. of Pilots, Halifax)	" 8	" 11
(Scraped and painted by us.)		
S.S. Water Witch (Furness-Withy & Co.)	" 11	" 11
(Repairs to rudder done by Purdy Bros.)		
S.S. Magdalen (W. G. Leslie)	" 12	" 19
(Repairs to engines being done by us.)		
S.S. Lillie (Hendry, Ltd.)	" 20	" 20
(Leak in hull stopped by owners.)		
Motor Boat Wasp B. (Halifax Shipyards)	" 20	
(Repairs and scraping and painting done by Halifax Shipyards.)		

on the ground, and the work of installation is proceeding rapidly.

The Shipbuilding Yard

The shipbuilding yard proper is being laid out for four berths, each of which can accommodate a 500-foot vessel. One of these berths, No. 4, is completed and the keel laid for the first ship. The berths are arranged for end launching, diagonal to the harbor, and there is ample water space to launch any size of vessel without difficulty. The No. 3 and No. 2 berths are in process of piling, and the groundways on No. 2 are laid down. This work was started only in June, 1918, and such good progress was made that No. 4 berth was ready for a keel in December last. The plates, however, which had been ordered last July, did not make their appearance until quite recently, otherwise the first ship would have been well ahead by now.

The cranes to be used in the building of the ships will be of the whirling boom type.

The gantry crane was considered at first, but it was decided that for endways launching the whirling boom type would be more convenient. With the gantry type, owing to the inclination of the ways, the runway of the crane would be high at the after end and low at the forward end.

The climate of Halifax is such that work can be carried on throughout the whole year without the necessity of covering in the building berths. It is claimed that weather conditions in Halifax closely approximate those of the North-east coast of England. This we imagine is probably a little tinged by local patriotism, but nevertheless, very little time is lost through inclement weather.

The company have received contracts from the Canadian Government for four steel ships. Two of these are to be of 8,100 deadweight capacity, similar to those recently launched from the Canadian Vickers, while the other two will be of the 10,000-ton type. The management are very hopeful of making the industry a permanent one as they feel that with up-to-date machinery and methods they will be in a position to compete with any yard on this side.

The repair end of the business is being strongly developed, and it is claimed that there should be no necessity of ships being taken to American Atlantic ports. The labor is made up almost entirely of local men, and up to the present there has been an entire absence of any unrest in that direction. Mr. McLurg, the general manager, who by the way wears the returned soldiers' button, hopes that by this summer the shipbuilding end of the company's business will be in full operation, with all four berths completed and occupied.

Quebec.—What is considered in shipping circles as a voyage extraordinary was started from Halifax to Quebec by the Canadian Government ice-breaker, Montcalm. The vessel convoyed a vessel down the Gulf late in January, and has made her way up the Gulf and the St. Lawrence at a date when no ship has ever before attempted the trip.

Sydney Foundry & Machine Co.'s Part in the War

A Shop That Started in a Small Way—Now Have Deep Water Wharves, Machine Shops, Foundry and Boiler Shop—A Large Drydock is Projected—The Visit of the Q Boats

THE harbor of Sydney, C.B., occupying as it does such a commanding position relative to the Gulf of St. Lawrence and all the Transatlantic routes, was very fully utilized during the four years of fighting.

Comparatively little was heard of the activities of this port, but the part it played in the Maritime phases of the war was an immense one. Its spacious harbor held at times as many as seventy deep-sea vessels, comprising transports, food and ammunition ships and their convoys, while average weekly number of ships using its facilities was between forty and fifty, outside of vessels permanently stationed at the naval base.

The navy department had large supply stores and shops located here, and the United States Navy Department were erecting a huge aerodrome when the armistice was declared. The harbor was used as a base for the patrol vessels operating on the coast, and of course was the bunkering point for a very large number of both naval and merchant marine craft.

Sydney is the nearest port on the North American Continent to any European port. It practically commands the entrance to the Gulf of St. Lawrence, and is on the direct route of all vessels coming from England or European ports to the large shipping centres of New York, Boston, or Portland. The harbor covers an area of twenty-five square miles, practically land-locked, with deep water all over it. It is accessible at any time of the day or night, and is open practically all the year round.

Within a radius of twelve miles from the harbor are the huge coal deposits of Cape Breton Island. The deposits here are sufficient to last, at the present rate of production, for three hundred years. It is a very good quality of coal for steaming purposes, and ample facilities have been arranged for bunkering steamers in the harbor. The piers will accommodate three steamers of 12,000 tons deadweight capacity at one time, and the tips can load coal at the rate of 40,000 tons per twenty-four hours.

Naturally with all these vessels coming and going there is an immense amount of repair work called for. This has been amply taken care of for some years by the Sydney Foundry and Machine Works, and for the past four years their efforts have been practically monopolized by the naval and mercantile transport needs.

A Small Beginning

The company was formed about seventeen years ago, and took over the premises which had been run as a general jobbing shop for some years previously.

The whole plant at that time consisted of a small frame building, in which was contained foundry machine shops and blacksmiths' shop. It has grown until now it covers an entire block, and the original shop is now just one corner of the foundry. At the present moment the foundry is being extended and a new cupola installed, and the whole foundry being brought up-to-date. When completed it will have two cupolas charged by an electric elevator, with their own motor-driven fans, and the floor will be served by an overhead electric crane.

Alongside of the foundry is the machine shop. This contains a complete equipment of machine tools, most of them being of new design. It is the policy of the management to renew their machine tools as often as a more efficient type appears on the market. Conspicuous among the heavy tools is a Fyfield horizontal boring mill, of the very latest type, and a particularly well-made and designed machine it is. The heads have a vertical travel of 43 inches, making it possible to bore out a cylinder up to 86 inches diameter. There is also a large vertical boring mill in process of installation. A gap lathe with a 72-inch face-plate is also a prominent feature, and this is fitted with extension pieces for the head and tail stocks, for jobs requiring a greater swing. There is also a 72-inch planer, which has also been fitted with an extension to the upright frames, to take in a larger job than it was originally intended for. The policy of the management is to find a way to do every job that comes along, and they say with pride that while in the early days they used to have to send out some jobs to other shops, the position is now reversed, and the jobs are sent to them. The illustration shows a part of the machine shop.

The Boiler Shop

Some few years after starting up, the necessity for a separate shop for boiler work became apparent. A considerable amount of work in the nature of sheet iron and steel plate construction, besides structural steel was being taken on. A cupola of fourteen feet diameter was built for the Dominion Iron and Steel Co. among other things, and quite a few steel stacks. A building which had been in use as a skating rink lay alongside the company's property, and this was acquired as a boiler shop. It was admirable for this purpose, as the arched construction of the roof left an absolutely clear space, free of all posts or other obstacles for the working floor. Some idea of the extent of this shop can be obtained from the illustration, which shows two steel stacks, of 150 feet in length, lying at one end of the shop. The shop is provided with the usual plate punches and shearing machines, besides an electric and oxy-acetylene welding outfit.

The Warehouse

The company owns, besides the shops already mentioned a large warehouse stocked with practically all the mer-



PART OF THE MACHINE SHOP.

chandise liable to be called for in a hurry by a vessel coming in. All kinds of packing, rubber and asbestos insertion, bolts, nuts, rivets, valves, and metallic packing are kept in stock so that there will be no delay in filling orders. A striking feature is the large stock of plates kept on hand. Passing by the storage yard in the train one would imagine that here was the storage yard of a large shipbuilding plant. The company claims to have on hand the largest stock of plates in Canada, and looking it over, this can well be credited.

The Water Front and Proposed Dry Dock

In order to have ample space to carry on the ship repair work, the company has acquired a water frontage of 1,800 feet where they have good deep water wharves. The depth of water is 38 feet at low-water spring tides, which is ample for almost any vessel using the harbor. Since the signing of the armistice a large frame machine ship has been acquired from the Navy Department, and this was placed on one of the company's pontoons and towed down to its new site, and there placed on foundations made ready to receive it.

There is now under consideration the building of a large floating pontoon dry dock. There is a considerable demand for a dock of this kind in Sydney. Large numbers of vessels come into the harbor smashed up in various ways, and these have to be repaired sufficiently to enable them to proceed to Montreal or Halifax, and in some cases New York to receive permanent repairs. This entails not only extra expense and delay to underwriters and shipowners, but a loss of considerable profitable business to Sydney.

The project was under consideration in 1914, and negotiations had been opened with the Dominion Government. With the outbreak of war it had perforce to be abandoned, but now that peace has come the idea is once more being taken up. It is proposed to build a dock capable of taking vessels up to 500 feet long and about 12,000 tons displacement, and if all goes well, work will be started very shortly. The need for the dock is shown by the fact that in two months ships needing repairs amounting to $1,500,000 were sent to New York.



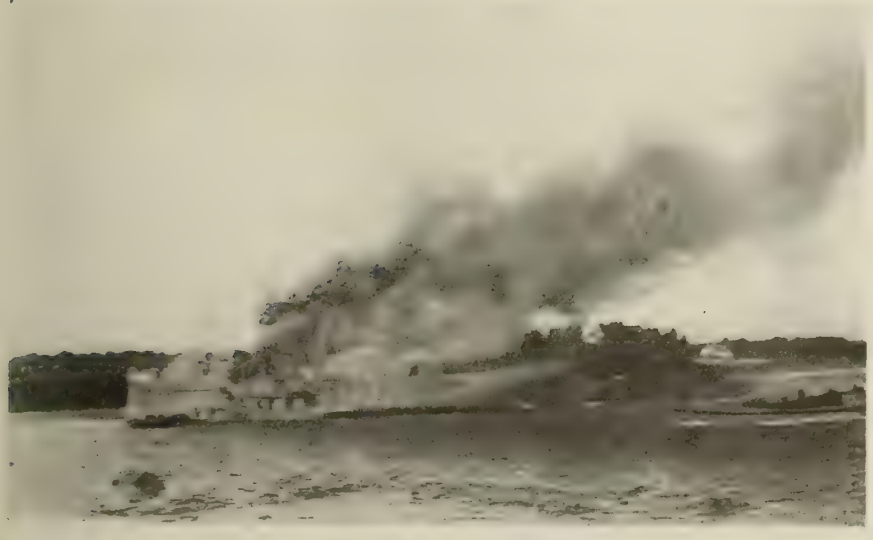
CORNER OF BOILER SHOP, SHOWING STACKS 150 FT. LONG BY 9 IN. DIA.

Some Interesting Jobs

Some very interesting jobs have been undertaken and accomplished during the last four years by the Sydney Foundry and Machine Company, and Mr. W. F. Clarke, the vice-president, is a mine of interesting information on this subject. Mr. Clarke came down to Sydney from Toronto with his father, who was the original founder of the concern, seventeen years ago. He is a practical machinist and engineer, having served his time with the Petrie Co. in Toronto.

One of these accomplishments was the raising of the steamer Cyprus, owned by the defunct Russian Government. This vessel was built in Seattle for a wealthy copper king, and was fitted up in the most luxurious manner. She was fitted with Babcock and Wilcox boilers equipped for oil fuel.

While lying in Sydney Harbor her Russian crew set fire to her, and the illustration herewith shows how well they did the job. All efforts to quench the flames proved unavailing, and it was discovered afterwards that oil-saturated waste had been plentifully distributed all over her. Finding it impossible to put the flames out, the second engineer went below and slacked back the condenser doors, allowing the seawater to come in and flood her engine and boiler rooms so that she sank in fairly shallow water. She settled down with just her fo'c's'le showing above water, and the Foundry Company took on the job of raising her. The illustration shows her rising from the sea after a cofferdam had been built and the water pumped out. Incidentally, lots of trouble was caused in the pumping out, by the pumps being continually being fouled by large pieces of oil-saturated waste. After floating she was towed to the wharf and refitted, and the third illustration shows her ready for sea again.



THE FIRE AT ITS HEIGTH.

Another incident showing some of the usual perils of the sea was that of a steamer that came in with the whole of her upper works practically wrecked by being swept fore and aft with a huge sea. This came aboard just forward of the bridge, and carried away the whole of the bridge, monkey bridge, and cook's galley. The second mate who was on watch on the monkey bridge saw the sea coming but had no time to avoid it. It washed him off the bridge overboard, brought him aboard again, and wrapped him around one of the after-deck winches, breaking his arm in the process. He was rescued from this position by

someone noticing his boots sticking up against the shaft of the winch. A peculiar feature of this disaster was that a pot of potatoes standing on the galley stove when the galley was washed away, was found down by the break of the poop, with the potatoes still in it. Contrary to the expectations of any one on



THE "CYPRUS" COMING UP.

board, the ship made Sydney, where she came into the hands of the company, and was all ready for sea in three weeks.

Still another hurry-up job was that of a steamer of the turret type that arrived in Sydney in a sinking condition, after being in collision. She was cut down from the top of the main hull eight feet below the water line, and the bow of the colliding vessel had penetrated through to the turret. As soon as she limped into Sydney Harbor a hurry-up call was sent to the Sydney Foundry and Machine Company, and the nature of the case explained. Mattresses were procured, and steel rails to make strongbacks. The strongbacks were placed on the rull and long bolts passed through the opening through other rails inside, and the mattresses placed over the hole. Then the bolts were tightened up and the rush of water stopped. The next job was to keel the vessel over far enough to get at the gash to make temporary repairs. The coal cargo was trimmed away from the injured side and over to the other wing till the hole was nearly clear. This involved considerable tipping, and a number of the longshore wiseacres were momentarily expecting to see her capsize.. However, being well guyed, nothing happened. The broken edges of the plates were trimmed away with oxy-acetylene torch, the beams straightened out by jacking, the hole patched up, and fifty-seven hours after she left with her cargo for Montreal. She discharged there and went from there to New York to be drydocked. Here was a case where a dry dock in Sydney would have been an advantage all round.

The Visit of the Q Boats

Sydney enjoyed a visit from those much-storied but little known products of the British Admiralty, the Q boats, during the period of hostilities. It speaks volumes for the wonderful way in which these vessels were disguised that no one suspected their real nature. They even passed the examining vessel at the mouth of the harbor without being discovered, and it was only those who were willingly let into the secret that ever knew it. These particular vessels were living and breathing imitations of the fishing schooner, so well known on these coasts. They sailed into the harbor with their dories towing astern, and other dories in nests on their decks in a perfectly innocent manner. However, the dories on deck were but a painted sham to conceal their real business. They were fitted with gasoline engines, and the exhaust pipe was cunningly concealed behind the ratlines and carried down below the water line. Within 2½ seconds of the sounding of the alarm the sham dories dropped down and a six-inch gun having an arc of fire all round the horizon came into view. The engines were started at the same moment, so that in less time than it takes to tell, the innocent fisherman became a sinker of U-boats.

Truly Sydney has played an important role in the Empire plan during the last four years, and it is the intention of the Sydney Foundry and Machine Co. which did so much to help, to perpetuate the part now that peace has folded her wings over the beautiful harbor.

ALL RECORDS BROKEN ON HAMILTON TRIP

Breaking all records for navigation out of the port of Toronto, the steamer Macassa left on March 6 for Hamilton with a mixed cargo of package freight. This is the earliest reported sailing from the port and is only rivalled by the year 1906 when the same steamer left the port on March 11, but was forced to discontinue sailings on account of ice after making several trips.

The Macassa is under the command of Captain G. J. Corson, who has with him Chief Engineer E. A. Prince and Purser J. Beckton.

The Toronto to Hamilton ship Macassa is a veteran of the Great Lakes and enters to-day her 31st season since she was built on the banks of the River Clyde in Scotland and crossed the Atlantic ocean under her own steam to enter the lake navigation service.

This time last year there was three feet of blue ice in Toronto bay and it was not until March 30 that the Macassa left on the first trip to Hamilton.

Navigation Openings

The following table give the opening of navigation for the past five years with the first ship to arrive in port:

1915, Dalhousie City, April	1
1916, Dalhousie City, April	4
1917, Macassa, March	30
1918, Macassa, March	30
1919, Macassa, March	6



REPAIRED AND READY TO SAIL

Building Sea-Going Steamers in Railway Car Shop

Machinery For Building Cars Also Suitable For Ship Work—All Plates and Shapes Rolled in Shops of Nova Scotia Steel and Coal Co.—Build the Engines Also



"WAR BEE" READY FOR SEA.

WHEN the Nova Scotia Steel and Coal Company decided to build a steamer, it was with the idea of providing an outlet for some of their product, and also of using the steamer for themselves. However, the general shortage of ships resulted in the vessel being bought by the Imperial Munitions Board, and an order for a second steamer was placed. These vessels have been built and delivered, and the company is now starting on two more vessels. The first ship built was the "War Bee" of 2,000 tons, followed by the "Watuka," of 2,400 tons deadweight, and the two vessels now in hand will be each of 2,800 tons deadweight.

Car Shops Used

The Nova Scotia Steel and Coal Co. have a subsidiary company known as the Eastern Car Company, which, as its name implies, was employed in building railway cars. A great deal of the machinery in use in these shops is of the same type as is used in shipbuilding work, and it was decided to utilize the machinery and shops in hand as a shipbuilding plant.

The Steel Company's own shops were in a position to furnish all the necessary plates, angles, bulb angles, etc., that would be used in the ships. They had the necessary plate and angle-rolling mills, thus there was no difficulty about obtaining the necessary steel. The car shops contained punches and shears, and besides these tools several hydraulic presses and punches of various types.

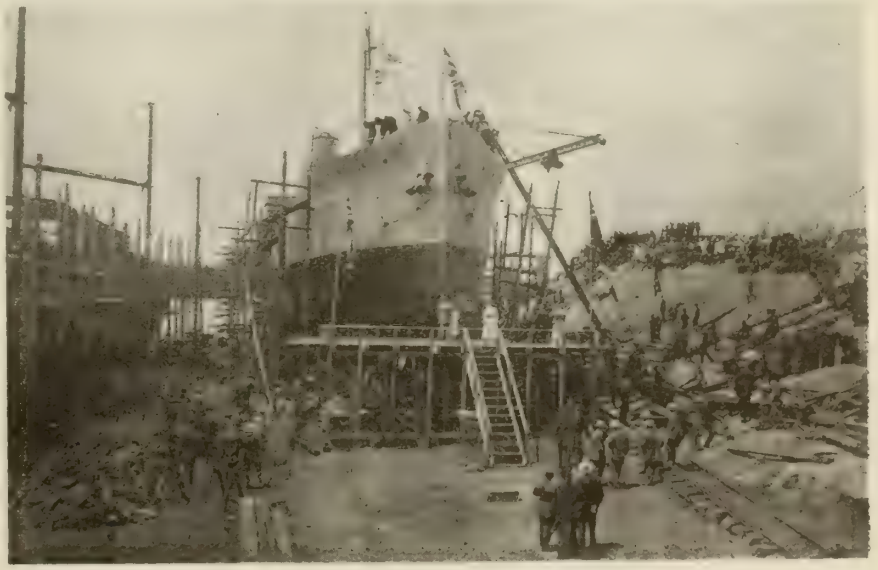
The Car Company have a large and up-to-date power house containing three sets of Westinghouse turbo generators, a two-stage steam-driven air compressor with a capacity of 13 000 feet of free air per minute, and a three-crank compound Laidlaw, Dunn, Gordon hydraulic pressure pump and accumulator. An angle furnace was installed and fitted with oil burners and forming slabs were laid down to bend the steel sections to the shapes required for frames, floors, etc.

The holes in the angles are punched in an automatic spacing machine. The templates are laid on the carriage of the machine, and pins placed wherever a hole comes. As the carriage travels along these pins strike a trigger which operates the punch, making the holes in the angle in the positions corresponding to the template.

The lightening and limber holes in the floor plates are punched out by a hydraulic press, to which a die and punch are fitted of the shape desired. Advantage is taken of the hydraulic machinery installed to joggle the frames, thus eliminating the necessity of fitting liners, and making only two thicknesses to be riveted instead of three, as would otherwise be required. This is done by placing the frame to be joggled under the platen of the press and putting a distance piece equal to the depth of the offset underneath the frame on each side of the required offset. A piece of the same thickness is placed on top, and the press coming down makes the required set in one operation. Great care has to be taken in making the molds for these joggled frames and in getting the offset in exactly the required space. It is estimated this method of building saves no less than twenty-four tons of liners in a 2 800-ton deadweight ship, besides the time necessary in fitting the liners. The absence of the extra thickness also tends to a smoother and tighter job of riveting.

Mold Loft

A part of the existing pattern shop was made over to a mold loft, and a large board laid down on which the fore body of the vessel in hand was laid off. This board is then transferred bodily to the shop at the forming slabs and the required shapes taken directly from it. While the fore body is in process of formation at the slabs, the after body is laid down in the mold loft in readiness for taking down when needed.



LAUNCHING THE "WAR WASP."

Built Engines Also

The engines were built in the shops of the steel company. All the patterns were made in the pattern room of the car shops, and the castings made by the Mathieson Foundry, a local concern. The shops of the steel company are well equipped for making the necessary forgings, possessing as they do, two hydraulic presses of large dimensions. The larger of these, which is a 4,000-ton press, is familiarly known as the "Big Chief," while the smaller, of 1,000 tons capacity is named "Papoose." These presses have forged practically all the shafts, crank, intermediate, tail and thrust, for the ships built at the Canadian Vickers plant, and some of those at the Collingwood Shipbuilding Company. The machine shops are amply equipped with heavy machine tools for turning these large forgings. At time of writing several large rudder posts were in the shops as well as thrust and intermediate shafts, and connecting rods. There is plenty of space for erecting, so that building the engines of these ships presents no difficulties to this company. One of our illustrations shows the completed engines for the "War Bee" in the erecting shop of the Nova Scotia Steel and Coal Company.

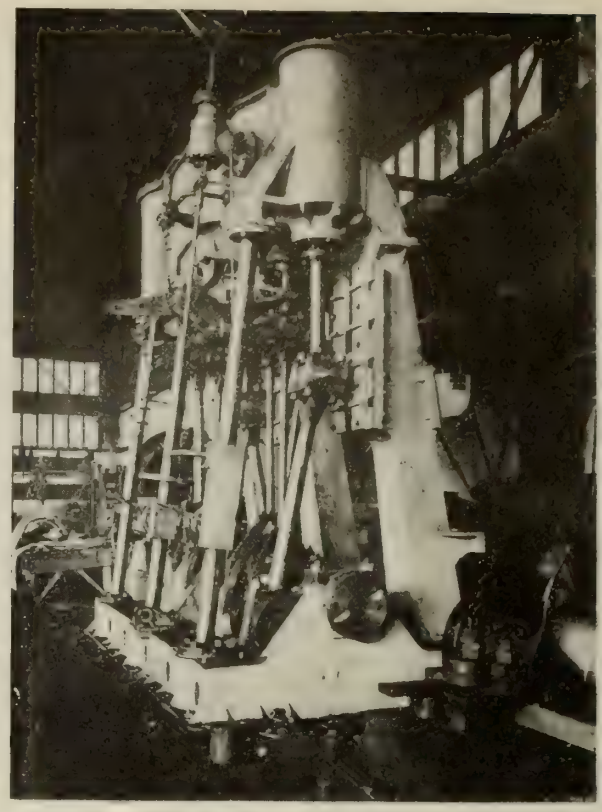
The Building Berths

A suitable site for placing the building berths was available on the Pictou River, adjacent to the car shops. Two berths were laid down close adjoining. The ships are launched endways into a natural cove, and this forms an ideal fitting-out basin. The banks are high here, and a set of shear legs are being erected on the edge of the bank for placing machinery and boilers on board the vessels after launching. The railway tracks come right down to the yard and through the shops, also communicating with the steel company's shops, which are but a few hundred yards distant, thus making the moving of heavy material easy. Locomotive cranes are employed to handle the stuff through the yards and the berths are fitted with cranes of the whirling boom type.

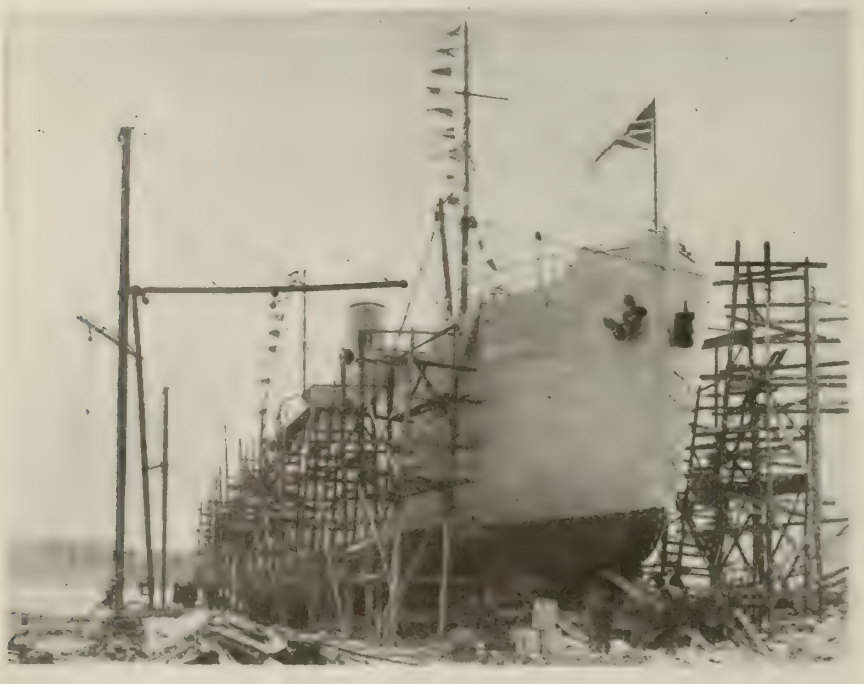
Owing to the fact that the plates can be rolled right at the shops, and likewise frames and beams, there is no trouble involved in getting material, and no delay. The rivets required are also made in the car shops. Castings can be obtained from the local foundry and the forgings are made in the company's own shops.

With all these natural advantages and the fact that skilled shipbuilders are being developed from the local labor market, the company feel that they can put up a strong competition with any yard in Canada. The fact of the labor being entirely local means that there is very little trouble from the turnover standpoint. Men having their homes right in the neighborhood have little desire to move away as long as conditions are anyway reasonable as compared to other centres.

Shipbuilding adds another industry to absorb the supply of labor, and also forms a profitable outlet for some of the company's own product. It is therefore safe to assume that as long as shipbuilding continues in Canada the Nova Scotia Company will be in the running.



TRIPLE EXPANSION ENGINE BUILT AT N.S. S. & C. CO. PLANT.



SS. "WATUKA" ON THE STOCKS.

HAMILTON.—The turbine steamer Floretta was in the bay on the afternoon of March 4, having left Kelly Harbor. The Floretta is the first boat known to the oldest residents of Hamilton to cross the bay at such an early date. Although the ice at Kelly Harbor is yet from four to nine inches thick, the Floretta had little difficulty in getting through to the open water.

Southampton.—By a vote of 242 to 8 the people of this town carried a by-law to guarantee bonds for $20,000 and otherwise aid the Sellers Kitchen Cabinet Co. of Canada.

The Davey Shipbuilding Plant at Lauzon

Building Wooden Steamers, Steel Trawlers and Large Steel Steamers—Have Two Large Dry Docks—The New Dock is Claimed to be the Largest in the World — Modern Installation

THE banks of the St. Lawrence River, near the ancient town of Levis, are once more resounding with the swing of the axe, adze, and caulking hammer as in days gone by. In addition to those old and well-remembered sounds the more modern clatter of the pneumatic riveter and the snap of the plate punch are also in evidence.



THE NEW DOCK UNDER CONSTRUCTION

The exact site of these activities is at the little village of Lauzon, about three miles below Levis, and opposite the end of the Isle of Orleans. There the Davey Shipbuilding Company are developing a large industry, modern in all respects, and including both ship repairing and shipbuilding. At the present time there are 1,400 men employed, and when the new shops are completed and the machinery installed, a much larger number will find profitable employment.

Present Contracts

The contracts at present under way are considerable. The wooden shipbuilding plant is employed on fifteen vessels of 1,500 tons each for foreign owners. These are all laid down, and some of them are in frame. The steel yard has six trawlers for the Department of Naval Service in varying stages of completion on the stocks, and there is also a contract for two steel steamers for the Canadian Government's new programme. The keels for these vessels are already laid, and work is going on on the floors and frames. All these vessels are arranged for end launching, there being ample room and deep water for this style of launching.

The necessary plate work is at present being carried on in the old shops which are equipped with the necessary rolls, punches and shears. The new shops, which are in course of construction, will be equipped with the most modern shipbuilding machinery, most of which is being imported from the Old Country. A feature of these shops will be an underground tunnel leading from the shop to the new dry dock, which will be described fully in this article.

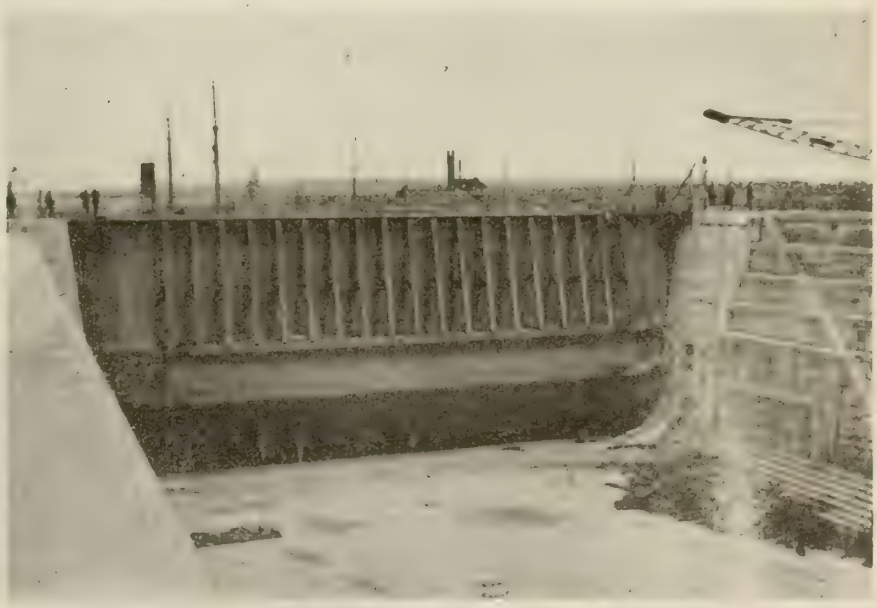
The Old Dry Dock

The old dry dock is a well-known feature in the history of mercantile marine work on the St. Lawrence River. It was commenced as far back as the year 1878 and was completed and fully opened for work in the year 1886. It is a large dock, well equipped to handle most of the vessels using the river. It is 600 feet in length by 31 feet deep, and has an extreme width of 100 feet, the width of the gate opening being 60 feet.

There are at present in this dock two large steam towing barges, brought down from the upper lakes for the purpose of convertion into sea-going steamers. The signing of the armistice having removed the necessity for this, these vessels will be sent back to the scene of their original duties with the opening of navigation.

The Pumping Arrangements

The power house containing the pumping engine for this dry dock is a relic of a former day. On entering, one receives the impression at first that one has strayed into a conservatory. A large airy room with lots of windows, each one containing a plant, with a beautifully oilclothed floor, and the machinery polished up to the last point of brilliance, forms a pleasing effect. The main pumping unit is a twin cross engine, built by the well-known old firm of Carrier, Laine and Co., of Levis. The crank-shaft carries a pinion wheel, which drives a large spur wheel on a second motion shaft. The pumps, which are set in a pit, are driven by cranks, one each side from this shaft, the pumps being vertical. The engine runs at about forty revolutions per minute and is capable of pumping about 700 gallons per revolution, or 28,000 gallons per minute. A compound vertical engine operate the gates through a worm gear, and the drainage pump is worked through an extension of the crank shaft of this same engine. Steam is supplied through a battery of four



THE MAIN CAISSON

horizontal return tubular boilers by the same makers.

The New Dry Dock

The new dry dock now in course of construction and almost completed, is an interesting work. Known as the Champlain Dock, it is claimed to be the largest dry dock in the world. The value of a dock of this kind on the St. Lawrence is beyond question, as repairs to ships of any size known at present can be made with ease. This will mean the saving of thousands of dollars every season to owners and underwriters, as permanent repairs can be made without the necessity of sending vessels to New York or to England under temporary repairs.

The dock has been built with an eye to being a long way ahead of ship construction, being some 200 feet longer than any vessel yet built. To enable smaller craft to be handled, it is arranged with a caisson at the half length so that it can be divided off. There are at present no less than fifteen small craft in its capacious limits undergoing various repairs.

The dimensions of this dock are as follows: Length overall, 1,150 feet, width on top being 150 feet, and on the bottom 125 feet; the entrance gate is the full width of the dock. The depth from sill to top is 54 feet, and over the blocks, 50 feet. It can be readily seen that it will be a long while until a ship too large to enter this dock will come up the St. Lawrence.

A Modern Power Plant

The pumping arrangements for this dock are in keeping with the size of the dock itself. The whole installation is being made by the Allis Chalmers Ltd., of Toronto, and is modern in every respect.



ONE OF THE TRAWLERS

The boiler installation consists of five water-tube boilers made by the Robb Engineering Company. There are four 500 h.p. and one 300 h.p. boilers, working at 200 lbs. pressure per square inch. These boilers are equipped with chain grate stokers and the coal and ash are handled by a Link Belt Company chain and bucket conveyor system.

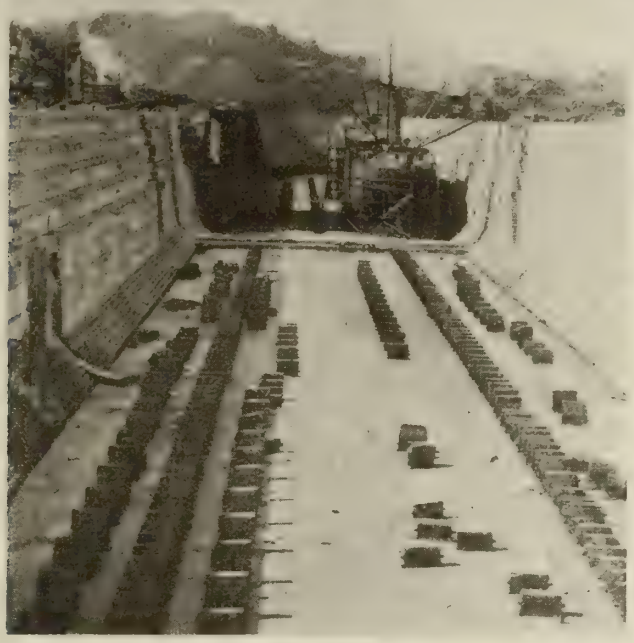
In the power house on the main floor are the power and lighting units. These consist of reciprocating and turbine units direct connected to generator as follows: A vertical compound high-speed engine by Goldie-McCulloch & Co., Galt, direct connected to Canadian General Electric generator, 150 kw., running at 475 r.p.m. This is the lighting set for the dock and plant. For power purposes there is one Curtis turbine direct connected to 1,500 kw. General Electric generator. This turbine works at 200 lbs. steam pressure per square inch, at 4,000 to 5,000 r.p.m., and drives through reducing gear, the generator running at 500 r.p.m. The generator is 550 volts d.c. There is a second Curtis turbine unit of 750 h.p. driving through a reducing gear, the turbine running at 5,000 r.p.m. and the generator at 720 r.p.m. The generator is a Canadian General Electric d.c. machine. A third unit is a 300 12 W. Curtis turbine running at 5,000 r.p.m., the generator speed being 1,200 r.p.m. These machines are of course all run condensing, the circulating pumps being of the centrifugal type, motor driven. In the sub-basement there are also the boiler feed pumps, two in number, 12 in. x 7 in. x 12 in. Canadian Allis Chalmers duplex, outside packed, drawing the water from a Cochrane open feed water heater. There is also a duplex Canada Foundry fire pump, with a capacity of 500 gallons per minute.

The pumping machinery is installed in a separate building, the main pumps being about 12 feet above the floor of the dock. The main pumps consist of three Allis Chalmers axial flow 48 in. centrifugal pumps. These pumps have each a capacity of 6 300 gallons per minute, with a twenty-five feet lift, and a speed



STEAMER ENTERING DOCK

of from 550 to 750 r.p.m. They are driven by 750 horse power Canadian General Electric shunt wound motors. In addition to these main pumps, there are two drainage pumps, set level with the floor of the dock. These pumps are also installed by the Canadian Allis Chalmers, and are 18 in. diameter radial flow centrifugal, of 6,000 gallons per minute capacity, with an eight feet lift.



THE NEW DRY DOCK INTERIOR

The main caisson is moved in and out of place by an 125 h.p. d.c. motor. The caisson for dividing the dock contains two axial flow pumps, centrifugal pumps, driven by 100 h.p. motors at 1,150 r.p.m., having a capacity of 500 gallons per minute each. They are supported on Canadian Allis Chalmers plate thrust bearings.

Other Work

In addition to the contracts already mentioned, the company is building the new bow for the steamer "North West." It will be recalled that this vessel was being brought down from the upper lakes in halves last fall and the bow end foundered in Lake Ontario in a storm, with some loss of life. The dock is booked up till the middle of next summer with various vessels to be repaired. The new shops, it is expected, will be finished and machinery installed by the month of June.

The originators of this dock have shown courage and foresight in investing the large amount of capital necessary in a work of this kind. Giving employment to such large numbers of men, it brings prosperity to the whole district, and it is to be hoped that work enough to keep the plant fully employed will always be on hand. This is the yard that lately turned out the C. N. R. car ferry Canora.

SHIPBUILDING IN JAPAN

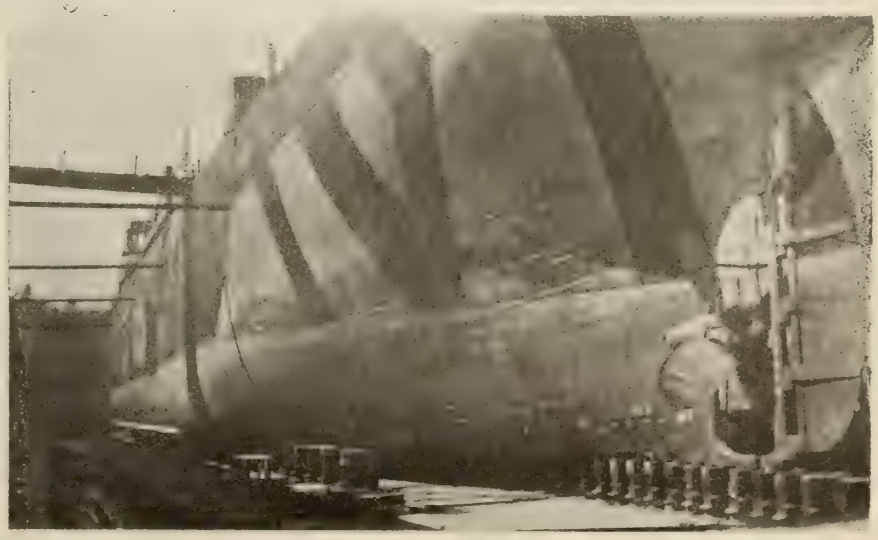
"The Times" shipping correspondent says: "While shipbuilding conditions in this country continue in some respects very unsatisfactory, it is desirable to remember that shipbuilding in other countries is making rapid progress. A notable reminder of this progress is the feat which has recently been accomplished in Japan of building a steel steamer of 5,800 tons gross and 9,000 tons deadweight within 29 days, of which details have now been received here. The keel of the steamer 'Raifuku Maru' was laid down at 7 a.m. on October 7 last; the vessel was launched at 6 a.m. on October 30. The official trials were successfully carried out on November 5, and within a few days she sailed laden for South America. The length of this vessel is 385 feet, her beam is 51 feet, and her molded depth is 28 feet. She attained a mean speed of 14.39 knots on the two trial runs of three miles each. The whole of the construction was carried out under the survey of Lloyd's Register.

"This feat of rapid construction is clearly an important and creditable incident in the development of the Japanese shipping industry, for the short time taken represents a very remarkable reduction on the period hitherto required even in the United States, where last year feats of rapid construction quickly succeeded each other. Great prominence was given to the building of the steamer 'Crawl Keys' at Ecoese, Detroit River, within 29 days, yet the 'Crawl Keys' was a much smaller steamer than the Raifuku Maru,' being of 2,300 tons gross and 3,300 tons deadweight, with a length of 261 feet 6 inches over all, a beam of 43 feet 6 inches, and a depth of 22 feet 6 inches. In each case a certain amount of preparatory work was done before the keels were laid, but making full allowance for any such fabrication it was found in the United States during the height of the crusade that 'records' bred 'records,' and a general expediting of construction was secured. Not impossibly the same process will be repeated in Japan.

"The 'Raifuku Maru' was built on the gantry system by the Kawasaki Dockyard Co., Ltd., at Kobe, one of the largest and oldest of the Japanese shipbuilding companies. It employs some 25,000 workmen, builds all types of warships and merchant ships, and has its own tube and plates."

Ottawa.—If Canada is to get the full benefit of her growing merchant marine, the vessels must be manned by Canadians thoroughly trained in navigation, according to a report of the Department of Marine and Fisheries tabled in the House of Commons. Where Canadians are not available British or American seamen should be used, in order that a common language might be used by both officers and crews.

Brockville.—Capt. Lewis J. Estes, of Chippawa Bay, made his usual trip by motor boat from Chippawa Bay to Alexandria Bay recently, encountering only a small amount of floating ice on the way. Capt. Estes has made this trip every week this winter. This is the first winter in the recollection of any of the present generation that the St. Lawrence, among the Thousand Islands, has not frozen over.



CAMOUFLAGED STEAMER IN DRY DOCK



GENERAL VIEW OF KINGSTON PLANT.

THE KINGSTON YARD OF THE COLLINGWOOD SHIPBUILDING CO.

THE yard of the Collingwood Shipbuilding Company at Kingston is a worthy branch of the parent company. Though of much smaller size, the plant comprises both the building and repairing branches of ship work, and the shops are equipped to deal with both these ends of the industry.

The plant in general consists of a dry dock, building berth, foundry, machine shop, plate and punch shop, rigging loft, etc.

The Building Berth

The building berth is of sufficient capacity, to build a full sized canal steamer, and is arranged for sideway launching. Last year there were built and turned out six of the trawlers for the Canadian Department of Naval Service. The berth is now engaged in the building of a 3,500 ton deadweight steamer for the Canadian Government new programme.

The Graving Dock

The dry dock is of dimensions sufficiently large to handle the ordinary run of steamer using the lower part of the River St. Lawrence between Montreal and the upper lakes. At the time of writing the steamer "Keywest" was in the dock. undergoing repairs to the bottom plating, while outside the dock the steamer "Keybill" was having repairs made to her plating above the water level.

The pumping work for emptying the dock is controlled from a power house situated at the dock side. Steam is supplied from four horizontal return tube boilers to the steam pumping units. These consist of two 18 inch diameter centrifugal pumps, driven by direct connected vertical engines, single cylinder, 18 in. diameter. These pumps are of 15,000 gallons capacity.

To operate the gates and drainage pumps there is a twin vertical steam engine, built by John Inglis Co., of Toronto. Installed in this pumping house is one of the Dominion Government's recording depth gauges, which record on a chart the depth of the St. Lawrence at every minute of the year.

Tool Room

At the inshore end of the power house building is situated the tool room, also the air compressor, and the electric power and lighting unit. The air compressor is of the cross compound, two stage type, and has cylinders 16 in. x 25 in. x 22 in., and 13 in. x 16 in. The capacity is 1,500 cubic feet free air per minute. There is also an American Gas Furnace Co. furnace, using city gas, which is used for tempering and hardening air tools, etc.

The power unit consists of a compound vertical open front marine type engine, running condensing, direct connected to a Canadian General Electric 260\/200 ampere, 290 revolutions per minute D. C. generator. The engine was built at the Collingwood plant of the Collingwood Shipbuilding Co., who are experienced engine builders.

Plate Shops

The plate shop foundry and machine shops are on the west side of the graving dock. The plate shop contains a good equipment for handling plates and shapes required in building and repair work. There is a plate edge planer by James Binnie & Co., Glasgow, and 18 feet plate roll, driven by its own steam engine; a Hillis & Jones horizontal punch, two Cleveland vertical plate punches, 2 shearing presses with 48 in. gap. The plate and angle furnaces are of the oil burning type, and have their binding slabs directly in front, as is usual. Further equipment consists of wall drills, electric and oxy-acetylene welding outfit, while outside the shop, to give plenty of room in handling long shapes, there is a Hillis & Jones double angle shear.

The foundry is chiefly remarkable for its undoubted antiquity. Its origin goes back to the dim and distant past, and the least guess at its age is one hundred years. It is a famous old place, and is familiar to all marine engineers on the lakes. Despite its great age and lack of modern facilities, excellent castings are turned out, not only for the yard itself, but for outsiders.



THE DRYDOCK AT KINGSTON.

Immediately adjoining the foundry is the machine shop. The most prominent tools here are a 48 inch by 48 inch planer, and a sixty inch face plate lathe. The mold loft is situated above the foundry and machine shop, and is of sufficient size to lay out the half length and width of a 261 foot ship.

In another building are housed the storerooms, and riggers' loft. The pipe fitting and coppersmithing shop is also on the ground floor of this building, the



LIFTING THE LAST FRAME.

pipe shop containing a six inch threading and cutting machine, and a six inch bending machine.

This is a case where an old shop has been adapted to modern requirements and excellent work is done with somewhat poor material. All the work for the ships is practically made by the Company. All the copper, brass, lead and cast iron piping are made on the premises. The engines are built in the Company's Collingwood yard.

The Company also make at Collingwood, all the joiner work for fitting out the berths, etc., and the furniture is made in a furniture factory in Collingwood controlled by the Collingwood Shipbuilding company.

The yard at Kingston is well fitted for carrying on repair work of all descriptions, and can build anything up to the full canal sized vessel. It is under the management of an experienced shipbuilder, Mr. J. Welch, who has had a long experience with leading firms in the Old Country, and is well qualified to handle anything coming under his care.

THE THREE RIVERS DIVISION OF THE NATIONAL SHIPBUILDING CO.

THREE RIVERS is rapidly becoming one of the largest manufacturing towns in the province of Quebec, if not in the Dominion. It has lately added to its other activities a revival of one of the oldest industries of the St. Lawrence River, that is wooden shipbuilding. Not only that, but in the building of wooden ships, the National Shipbuilding Co. have achieved a record for the Continent of America in speed of erection of which they are justly proud.

The yard at Three Rivers is a branch establishment of the National Shipbuilding Company of New Orleans, Louisiana. At the latter plant they are busily engaged in building steel tank ships, of which they have six in hand. Three of these are already launched, and three are nearing completion. At the Three Rivers yard they are building ten wooden vessels for the French Government of 1,500 tons deadweight capacity. All of these vessels are in frame, and with the departure of the ice from the St. Lawrence, launching and fitting out will commence. The dimensions of these vessels are 204 feet 6 inches in length by 39 feet eight inches wide, by seventeen feet deep. They will be equipped with compound twin screw engines, of 12 inches by 24 inches by 26 inches stroke, built by the Canadian Allis Chalmers, Ltd., Toronto. The boilers for these vessels are of the Scotch marine type, 11 feet 6 inches diameter by 10 feet long.

The keels for these vessels are 18 in. x 18 in. and the frames lapsided 18 in. They are moulded 20 inches at the keel, 14 inches at bilge and eight inches at head. They are spaced twenty-seven inches centres. The stems are 18 in. x 18 in. and apron 18 in. x 24 in.

Two of these vessels will be ready for launching at the beginning of May and all of them will be away by the fall, presumably before September.

The method adopted in building the ten vessels at once, is to divide the work into two units, each unit consisting of five vessels. To each of these units there is a full mill equipment. The two mills and ship yard employ a complement of one thousand men. Each mill is equipped with bevel planers, bevel band saws, Fay and Egan's double swing saws, and other necessary woodworking machinery. The iron work required for fastenings, etc., is made in a fully equipped blacksmith's shop, one to each mill. There is also a machine shop, where all the necessary tool work is done.

A Record in Framing

We spoke a little earlier in this article of a record being made at this yard. The record consisted of the moulding, cutting, boring, assembling and erecting of the complete number of frames for one vessel within four working days of nine hours each. This was achieved by a working gang of 56 men, and is the more remarkable when it is considered that about 80 per cent. of these men had never been engaged in ship work previous to October, 1917. The average number of frames prepared as described above was sixteen per working day, and the maximum number per day was twenty-two, this being achieved on the fourth day. One of our illustrations shows the last frame being raised into place.

The vessels whose dimensions have already been given, will be equipped with standard deck machinery. They have large hatches, three in number, 16 feet by 20 feet. The accommodation in the twin decks is for twenty-four men, and are of the same general type as the other wooden vessels being constructed for the French Government at various yards in Canada.



VESSELS ON STOCKS AT THREE RIVERS

Wooden Shipbuilding Activities at St. John, N.B.

Wooden Steamers and Auxiliary Schooners Built at St. John— St. John is Also Headquarters For the Semi-Diesel Oil Engine Trade—Description of the Harbor and Port

THE port of St. John, N.B., not to be outdone by other shipbuilding centres of the Dominion, has contributed to the shipbuilding efforts of the country. This was done by two firms, that of Grant and Horne, whose yard is situated on Courtenay Bay, and the Marine Construction Company on the Strait Shore.

Messrs. Grant and Horne launched last August the wooden steamer "War Fundy," of 3,000 tons deadweight capacity, and have now on the stocks a sister vessel, to be called the "War Moncton." They have also an auxiliary schooner under way, the dimensions being 159 ft. by 36 ft. beam, by 13 ft. in depth. This vessel is being built for Messrs. Elkin and Foster. The ways are arranged for end launching in both ships. The "War Moncton" will be ready for launching in May next.

The Marine Construction Company launched in June last the four-masted schooner "Dornfontein," which was speedily fitted out, and left for a voyage to South Africa at the end of July. Unfortunately she had hardly commenced her voyage when she fell in with a German submarine operating off the coast of Nova Scotia. The crew were allowed to land, but the "Dornfontein" was sunk by gun fire. In the middle of February the same firm launched another vessel of the same class but of slightly larger tonnage, to be fitted with auxiliary engines.

Another interesting activity of the port of St. John is contributed by the Fairbanks-Morse Company. This firm has fitted a considerable number of auxiliary schooners built around the adjacent coast with semi-Diesel oil engines, and this class of coaster is rapidly becoming popular. These installations run from 100 to 200 h.p., and a few representative examples are given here: "Bianca," built for Bowring Bros., Newfoundland, and fitted with 100 h.p. engine. The "Ruby W.," owned by Bayne Johnstone, St. John's Newfoundland, 100 h.p. engine, 5½ knots under power only. The "Volunteer," of 230 tons gross, brigantine rig, 7 knots loaded, power only. The "Samuel W. Courtenay," built for George M. Barr Co., St. John's, Newfoundland, 490 tons gross, fitted with two 100 h.p. engines, made 7 knots fully loaded against tide. On a voyage from St. John's to Gibraltar she averaged 100 gallons oil per twenty-four hours per engine, the oil costing about 10 cents per gallon. A good example of the modern auxiliary schooner is the "Jutland," 148 ft. by 25 ft. 4 in. by 12 ft., now building for the Le Havre Fish Co., Le Havre, for the salt fish trade in summer and fishing in winter. She will be equipped with electric light, electric pumps, auxiliary fire pump. The generator will be driven by a semi-Diesel oil engine, and she will have two 200 h.p. semi-Diesel engines for propelling purposes.

Another projected activity is that of the St. John Dry Dock and Shipbuilding Company, which purposes building and repairing steel ships, and also carrying on a wrecking business.

The Harbor of St. John

Some interesting details of the harbor of St. John are contained in the following paper by Mr. Grey, of the Public Works Department of the Canadian Government, at a meeting of the Engineering Institute:

"St. John Harbor is situated at the estuary of the River St. John, which is about 460 miles long, with a drainage area of 26,000 square miles, and an average flow of about 20,000 c.f.s.

"The river discharges into the head of the harbor, through a rock gorge about 1,200 feet long and 400 feet wide. The small cross-sectional area of the channel does not admit the flood as fast as it rises, or discharge the ebb as fast as it falls into the bay. The minimum summer level of the water surface of the river is 15.0 feet above low water datum of harbor, and the tidal range in the harbor is 13 to 30 feet. The variation of the sea level, therefore, at high water is from two to fourteen feet higher than the river, thus forming at every tide the Reversing Falls. The extreme high water of the river during spring freshet rises from ten to eighteen feet above the minimum. Navigation between the harbor and the river is only possible for a period of from one-half to one hour, occurring before and after high water—the time generally being about two and a half hours ebb and three and a half hours flood. At Indiantown, about one mile above the Falls, high water occurs about one hour six minutes, and low water occurs two hours twenty minutes, later than high and low water in the harbor. The average tidal rise at Indiantown, about one-half mile above the Falls, is about 1.3 feet.

"The gorge at the head of the harbor, with its merged reef, forms a slack water reach, which is navigable for small craft from St. John to Fredericton, about eighty-four miles, and for a total of about ninety miles on several tributaries of the river. This slack water reach acts as a settling basin, in which the heavier silt is precipitated.

"The exposure of the harbor is from the southeast to the southwest. The prevailing winds are from the northwest, from which the severe storms generally originate, and afterwards change to the south, causing considerable inconvenience in the harbor. The height of the maximum waves during these storms is about ten feet.

"The Negro Point Breakwater, 2,250 feet long, is of the rubble mound type, with stones placed at random on the outer slope, weighing two to eight tons, with concrete superstructure for about 946 feet. It was originally designed with a cribwork core, commenced in the spring of 1875 and completed in September, 1877. A heavy storm, however, on the 11th and 12th February, 1879, carried away 1,300 feet of the cribwork to from ten to nineteen feet below high water. From that date to about 1887, work was annually carried on in placing stone to bring the seaward side to a uniform slope of three to one. There is now a concrete superstructure fifteen feet wide for a length of 946 feet. The seaward slope at concrete superstructure is two to one. The portion of breakwater, without concrete superstructure, has been raked down by storms to a slope of about six to one, and the crest has been moved towards the harbor about thirty-five feet off centre line. Around the lighthouse are placed concrete blocks weighing about sixty to eighty tons each; they are founded a little above low water level. Mr. Shewen, who designed these blocks and the method of construction, arranged the work so that the pouring of concrete was begun as soon as the foundation was dry, and proceeded with at such speed as to keep the top block above the rising tide—the covering of the casing being pressed down upon a cushion of jute stuffed with oakum before the tide rose to the top of the block. After extreme storms, marks on the stones, the disappearance of seaweed from the surface, and the displacement of the larger stones indicate the considerable forces exerted. The concrete work in the breakwater is in first-class condition, and offers encouragement for concrete in salt water, providing sufficient care is exercised in mixing and placing.

"Observations with a marine dynamometer gives the force of waves at breakwater a pressure of upwards of 4,000 lbs. per square foot.

"Through the opening of about 1,500 feet between the end of the breakwater and Partridge Island, heavy southerly waves break and expand, following the ragged face inside the shore, and continue to roll towards the harbor causing such extensive erosion of the coast line that protective measures had to be taken in building a revetment wall along the foot of Fort Dufferin.

"The principal development in the harbor to date has been on the west side, on which there are at present ten berths, with thirty-two foot draft, and room for fifteen additional berths as soon as Negro Point Breakwater is extended to

Partridge Island, and railway facilities rearranged. On account of the limited frontage, and the railway terminal situation, however, the harbor is being developed from both sides.

"The entrance channel is 12,000 feet in length and 600 feet in width, and 32 feet clear depth at low water is maintained by annual dredging—the annual siltation varies, but generally amounts to about 2 feet.

"When the Negro Point Breakwater is extended to Partridge Island (about 1,500 feet) the littoral drift from the southwest will be arrested and the flow more concentrated in the channel will increase the scour and assist in maintaining the channel depth.

"During the year there are generally only two to eight tides below zero, forty 0.5 tides, and sixty tides 1.5 feet above zero, the remainder of the tides range from 2.3 to 6.7 feet above zero. Boats generally prefer to berth at slack water —it is, therefore, evident that the channel is navigable for the largest steamers.

"The wharves are built to provide thirty-two feet at low water. The harbor fortunately is free from the teredo, limnora and other sea worms. The type of construction up to the present has been timber cribwork and concrete with cribwork structure. On account of the scarcity and high cost of timber and the necessary extreme height of the wharves, about sixty-five feet, other types of structure are being investigated.

"The outstanding features in St. John Harbor are the extreme range of tide and the consequent currents.

"The inward mean tide tidal flow is about 20,000 c.f.s. and the outward is about 40,000 c.f.s. (The maximum surface current velocity at the minimum section in the harbor is about four miles per hour.)

"Unfortunately, no systematic meterings have to date been made of the river, and consequently the river flow is only an estimate. A series of float observations have been taken at various stages of the tide, and at various depths below surface. These show very erratic current conditions. The fresh water from the river flows out while underneath the tide rises and falls regularly.

"The principal wharves are of cribwork with concrete structure, the cribs being placed on a prepared dredge bed, covered to an average depth of five feet with broken rock. Behind the cribs, selected dredged material is filled in, on which the necessary railway sidings and sheds are built. The sheds are one storey, of timber construction. At a number of the wharves grain conveyors are built from which boats can be loaded with grain at any stage of the tide. In addition to vertical fenders of 12 by 11 inches hard pine, floating fenders about 36 inches diameter and 33 feet long are placed about 80 foot centres. It may be noted that in berths fifteen and sixteen, which are more exposed to wave action, the life of these floating fenders does not exceed two years.

"The Courtenay Bay development on the east side of the harbor comprises the building of a dry dock 1,150 feet in length, 125 feet wide, with 40 feet of water on sill at high water, ordinary spring tides, and elevation of sill fourteen feet below low water, spring tides; the building of a breakwater 7,070 feet long, of which 4,570 feet have been completed; the dredging of a basin 32 feet below zero, and channel 22 feet beow zero (zero being extreme mean low water). The breakwater is of rubble mound type, top width twenty feet, seaward slope varying from two to one to three to one, according to location.

"St. John, on account of geographic situation and railway haul, to date is principally a winter port. The traffic in 1895 amounted to three and a third million dollars imports, and three million dollars exports, whereas during the year 1917, the traffic amounted to sixteen and three-quarters million imports, and two hundred million dollars exports.

M. V. "CHIRALITE"

The "Chiralite," shown on the photograph, was designed by the Taylor Engineering Company, Ltd., for the International Petroleum Company for use in connection with their development work on the Peruvian coast, and is 85 ft. 0 in. in length with a beam of 18 ft. 6 in.; depth of hold 7 ft. 0 in.; draft 6 ft. 0 in. She is a comfortable sea-going little vessel of very staunch construction, and is powered with two Model "D" 70 B.H.D. heavy duty Sterling engines, which give her a sea speed of about 9 knots when fully loaded.

Her frames are of white oak, 3 in. x 4 in., steamed and bent to shape. The planking is of Douglas fir from the keel to the turn of the bilge; above this the planking is of red cedar; this timber is peculiarly well suited to topside planking on account of its non-shrinking qualities, when cut edge grain.

The decks are of Douglas fir 2¼ in. in thickness. Heavy waterways are also fitted 4½ in. x 9 in. in width; a shelf of the same dimensions is also fitted below deck beams; that is reinforced by three clamp strakes, 4½ in. x 4½ in., which are sprung in in one length.

Two holds are provided for freight, one forward and one aft; the after one is intended more for stores and gear than cargo. A load of about 10 or 12 tons can be easily stowed in the fore hold.

Comfortable crew's quarters are provided in the forecastle, which is provided with good light and ventilation.

The officer's quarters and saloon are built amidships and are particularly roomy and comfortable, finished in Spanish cedar.

Ample cold storage room has been provided, as this is an essential in a hot climate.

This little vessel has proved a fine sea boat and is very popular at her headquarters in Talara, Peru.

Yarmouth, N.S.—An ideal launching took place from the shipyard of Capt. Omer Blinn at Grosses Coques, Digby Co., when a handsome stern schooner of 440 tons net was put afloat for Mr. F. K. Warren, of Halifax. This splendid vessel is most thoroughly built and fastened to comply in every particular with the French Veritas in which she is classed for twelve years. Her cabins are beautifully finished in ash and are most modernly equipped with every convenience for the comfort of her officers and crew. As the vessel slid down the ways she was christened Maid of Scotland by Mrs. Haughn, wife of Capt. Wallace Haughn, of La Havre, who will command her. Capt. Blinn's yard has been a busy centre all through the present boom in shipbuilding and promises to be for some months to come, as he is already making preparations to build a 700-ton barkentine for Mr. Warren.



THE MOTOR BOAT "CHIRALITE."



PART OF SEA WALL, HALIFAX TERMINALS

The Canadian Government's Ocean Terminals

The Government Are Spending Thirty Millions of Dollars on the Port of Halifax—Will Make Halifax the Best Equipped Port on Atlantic Seaboard—Considerable Progress Has Been Made

THE visitor to the port of Halifax, who has not been there for two or three years, will find vast changes. The first thing to come to his notice on entering the city by the Government Railway is the fact of the line branching off from the harbor front at the north end of the city, and making a detour through about two miles of rock cutting to the new station at the south end. Here the train runs into the temporary depot, erected on the site of the new union station, which will be a beautiful granite structure. Outside of this depot there are already constructed a network of tracks for handling freight cars, communicating directly with the new quays and basins. Of the new piers and basins, the northernmost is practically completed, and is in daily use. Large coal clams for loading and discharging coal have been erected on the wharves of this basin and numerous vessels are handled daily. On the occasion of the writer's visit recently, the following vessels were observed at the wharf, loading and unloading: The "War Gaspe," "War Huron," "War Quebec," "Canadian Voyageur," and "War Witch." It is noteworthy that all of these vessels are of Canadian build, and represent both wood and steel construction. The "Canadian Voyageur" is the first of the Canadian Government's new programme, and bears the distinction of having descended the St. Lawrence at a later date than has hitherto been attempted by any large merchant steamer.

The large landing quay has been practically completed, as far as the sea wall is concerned, and its magnitude can well be realized on gazing along its length. The following general description, prepared for the Halifax Board of Trade, gives a very good idea of the extent of the whole undertaking. The illustrations show different points in the progress of the work.

Some idea of the extent of the business handled by the port of Halifax can be gathered from the statistics for the year of 1918. The customs receipts for the year were $2,261,581. The tonnage of vessels entering and leaving the port amounted to 15,836,554 tons. The value of the imports was $14,760,000, and of the exports $127,642,512. The bank clearings were $216,084,415, and the population 62,840.

Halifax, as a port of call and terminal, outgrew its facilities years ago. Steamship companies have been seeking an entrance into this port, on account of its exceptional advantages. Its port charges are the lowest on the Atlantic seaboard. Steamships of the largest type—the "Olympic," for instance—berth here without the aid of tugs and other incidental charges.

The harbor is one of the finest in the world—open all the year round, one of the easiest of access either by night or day, and also one of the best protected; a rise and fall in tide of 4 to 6 feet only.

Delegates of representative men, from the City Council and Board of Trade, from time to time visited Ottawa to discuss increased terminal facilities with the Dominion Government. These delegations were joined by some of the leading steamship men of Montreal, who have interests in the "city by the sea."

Several plans for the development of the harbor were subsequently submitted, but none of these were acceptable, being considered entirely inadequate, in view of the yearly increase in port tonnage, etc. At that time, the port was equipped with ten berths, capable of accommodating the largest ocean liners of the day and increased accommodation for sixteen steamships only.

In May, 1912, the Government placed the whole matter in the hands of Mr. F. W. Cowie, B.A., Sc. M. Inst. C. E., of the Montreal Harbor Commission, as consulting engineer, and Mr. James McGregor, A. M. Inst. C. E., A. M. Can.



CONSTRUCTION WORK ON TERMINALS



PREMIER BORDEN LAYING STONE.

Soc. C. E. The latter, who had previously been with the Grand Trunk Pacific Railway on construction work in Western Canada and also had considerable experience in the building of terminals in some of the principal ports of the world, was appointed resident engineer.

He selected a site, formerly known as "Fresh-water" at the extreme south end of the city and bordering on Point Pleasant Park, and planned a landing quay 2,006 feet long and five piers, 1,250 feet long by 360 feet wide, with basins 360 feet between, the whole scheme occupying a mile and a half of water front, within twenty minutes steaming from the Atlantic ocean and considered one of the best sites in the harbor front for the purpose. The plan gives berthing accommodation for twenty-seven Atlantic liners of the present largest type, and the total area used for the locating of these mammoth piers is 260 acres, of which 198 acres is of land and 62 of water. The piers will have a depth alongside of 45 feet of water at a low water of ordinary spring tides.

The quay and pier walls are unique of construction on this Continent, consisting of cellular reinforced concrete blocks 31 feet wide, 22 feet long and 4 feet 1½ inches in height, and weighing in the neighborhood of 64 tons each; those blocks, facing the bulkhead passenger landing quay and piers, are being placed one on top of the other, thirteen in height, some of the cells being filled with concrete and some with rubber; thus the entire project will have a concrete facing of 30 feet in width, its entire length faced with granite from one foot below the low water mark upwards.

For the purpose of moving these immense concrete blocks a powerful travelling crane is used. First, however, a foundation under water is laid by means of a diving bell with a working chamber sufficiently large for eight or ten workmen to move easily about on the bottom of the harbor. After rock bottom is obtained, concrete bases of about 6 feet square are built, on which the blocks are placed by being lowered by the crane; this crane travels along on the concrete blocks already laid.

The concrete blocks are so formed that each stack of blocks by being cemented together by the concrete placed in the cells forms a unit, but each stack is a separate unit kept together by concrete diamond shaped piles, used as keys and guides in placing. Thus the units are allowed to expand and contract—there being practically the same contraction and expansion in concrete as in steel.

The plan also calls for up-to-date immigration quarters. This building will be 800 feet long, built of granite, and with the best appointments procurable. It is in direct connection with the Union Passenger Station.

The Union Passenger Station, with concourse and train sheds for ten passenger tracks and sufficient room for future extension when required, will be of granite and of very fine architectural design. The contour of the land will place the main floor on the same level as the landing deck of a first class Atlantic liner, consequently no steps to ascend or descend. The baggage and express will be handled underneath the main concourse. The appointments of this building will be in keeping with the entire scheme and the cost of this building, alone, in the neighborhood of $2,000,000. Each of the piers will have four large freight sheds with tracks on either side and eight tracks the entire length. There is a grain elevator of large capacity and most modern type to be built in connection.

The well-known construction firms of Foley Bros., Welsh, Stewart & Fauquier, who have been engaged in large railway undertakings in the West, and the Cook Construction Company and Wheaton Bros., Limited, have been working on these mammoth docks and railway connections for three years, and sufficient progress was made in pier construction for the docking of four steamers the past winter.

The plan also calls for direct service yards, with sufficient car storage accommodation, round house, and otherwise equipped.

The whole scheme is connected with the present railway by a cutting travers-



CORNER OF NEW BASIN.

ing the western section of the city, and meeting the present main line at Fairview. At the latter point a terminal yard is being built, a mile and a half long by 300 feet wide, with standing room for about 2,000 cars.

The present terminals at the north end of the city, also at Richmond, consisting of ten berths, with all rail facilities, etc., will continue to be used—those at Richmond for bulk freights, such as lumber, etc. At the latter point a concrete pier (New No. 2) was completed in 1915, 700 feet long by 245 feet wide, containing two tracks within the shed and one on either side, without. The shed on this pier, also, of concrete, is of two storeys, the lower storey having two freight platforms, 90 feet wide, the entire length of the pier; upstairs is fitted for immigration quarters, etc. This pier cost, completed, $1,250,000.

The increases in the port's business, of late years, have been enormous—the imports and exports of 1913 totalled $26,979,816 and in 1918, $142,402,512.

With Transcontinental railway lines seeking an entrance into this city, an average increase in shipping tonnage of practically 2,000,000 per year during the past five years, will give some idea of how the port of Halifax is forging ahead.

The building of the new terminals and the area used, meant the re-housing of a large number of families, as it contained 111 dwellings, and consequently, has increased the building boom in other sections of the city. Building permits in 1915 were over $250,000 in value, in excess of the previous year and a relative increase in 1916. In 1918 they totalled $2,955,406.



THE BASIN UNDER CONSTRUCTION.

CONCRETE SHIPS AND THE CLASSIFICATION SOCIETIES

A report has just been presented to the Committee of the Italian Naval Register by their chief engineer (Ing. Domenico Barricelli) on the subject of concrete ships.

In the course of his report the engineer dwells at length upon the difficulties which face classification societies in the inspection of monolithically-built concrete ships in the course of their construction. He points out the responsibility placed upon the societies in requiring their representatives to be present at every moment and stage of the construction if they are to be completely satisfied that everything has been done in accordance with the specification and requirements, and he writes thus:

"The survey and the efficiency of the inspection of a reinforced concrete ship during its construction becomes a rather complicated matter in the case of a monolithic structure, but it is reduced to a minimum in the case of construction by 'elements' or 'units.'

"In such a construction the selection and the survey of each member can be done separately. Before assembling them on the slipways each unit can be tested as far as good quality of material and its resistance to a specified stress is concerned.

"On this subject I should like to call particular attention to a system of ship construction in units, already in use in England (Ritchie system), in which the units comprising floor plates and shell, side frames and shell, and the deck beams are pre-cast in molds and erected in their place in the hull after a period of maturing.

"These pre-cast members are of reasonable dimensions, easy to handle, and possible to inspect before incorporating in the ship.

"In our opinion this system, when experience has proved its adaptability to ships of large dimensions, constitutes an enormous advantage to a classification surveyor in his task of inspection."

BOOK REVIEWS

Practical Ship Construction, by A. W. Carmichael, Lieutenant Commander. Construction Corps, U.S. Navy, Member of Society of Naval Architects and Marine Engineers, published by the McGraw Hill Book Company, New York.

This is a very complete work on the subject that it deals with. Starting in with a chapter on stability of floating bodies, propulsion endurance, etc., under the caption of "Requirements of Ships," the reader is led in the second chapter to a general description of ships, including form, arrangement, types of ships, tonnage, and materials.

Chapters 3 and 4 deal with the structural members of ships and the design of the ship itself. The chapter on structural members goes very fully into dteails of frames, hulls, keelsons, floors, and intercostals, and is a very valuable chapter. The chapter on design deals with elementary requirements, choice of form, displacement etc., and calculations of stability.

The requirements and sites of shipyards, management, tools necessary, various kinds of labor, are treated at length. The book is profusely illustrated, there being 101 cuts, and the whole forms a valuable addition to the literature on this subject.

ELEMENTS OF WOOD SHIP CONSTRUCTION

Elements of Wood Ship Construction by W. H. Curtis, naval architect and marine engineer, is the title of a new book published by the McGraw Hill Book Co. of New York. The book was originally compiled by Mr. Curtis for the education and training section of the Emergency Fleet Corporation, and was intended for the use of carpenters and other tradesmen. The subject matter has been completely revised and enlarged for publication in book form, and covers the construction of the wooden ship in detail.

The book is divided into five chapters, the first chapter starting, as it should, with the keel, stem and stern post construction.

The second chapter deals with frames in general, and the subsequent chapters go on to details of the hull, deck, and planking, erecting and joiner work. The first three chapters are furnished with a glossary, in which technical terms are clearly defined.

The book is profusely illustrated, the diagrams being very clear, and well explained. A very helpful book for students, workmen and draughtsmen not familiar with the details of wooden vessels.

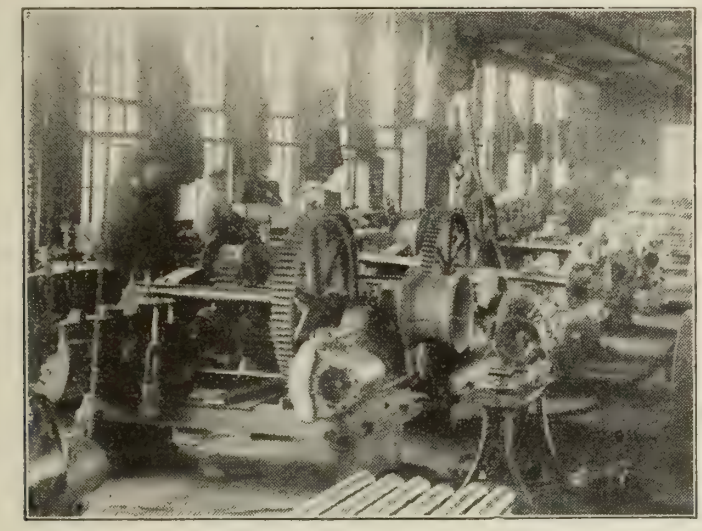
Vancouver, B.C.—Mr. G. D. Swann, consulting engineer for the Dominion Government, has investigated the harbor facilities of Victoria and Vancouver in connection with the placing of orders for steel ships.

GENERAL FEATURES OF STEAM WINCH DESIGN

By A. W. SWAN, B.A. Sc.

UNTIL recently neither the United States nor Canada were shipbuilding nations. However the war acted as a spur in this as in many other directions, and no one has been more surprised at the progress made in both countries in this direction than their own citizens. Along with the actual shipbuilding went the manufacture of the varied equipment that goes to make up the complete steamship: main engines, steering engines, lighting sets, pumps, and winch engines.

The winch engine is one of the principal of the auxiliary engines to be found on board ship. Without it cargo could not be transferred quickly to and from the holds, and as quick loading and unloading has a considerable effect on a ship's net efficiency it can be seen that the winch engine plays an important part in the general scheme of things.



ERECTING WINCHES IN SHOP

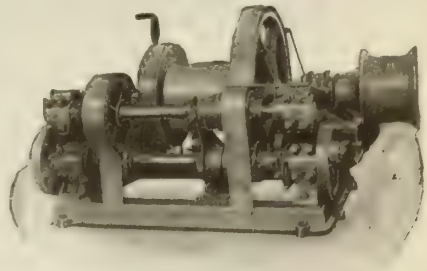
Under the former regime in Canada ships had not been built in any large number, and every one was built to a different specification. The result was that while there were successful shipyards no manufacturer has considered it worth while to go in for auxiliary equipment on a manufacturing basis. With ship construction considerably standardized, conditions were changed, and orders began to come in sufficient quantity to warrant winch engines, among other equipment, being "manufactured."

As Great Britain has been the great shipbuilding country of the world so has it been the home of most of the standard designs connected with ship construction and British influence is seen in the winch engine. The United States has been constructing ships in large quantities, and certain differences have arisen between American and British practice even in this part of the equipment. For instance, there has been developed a throttle reverse, but British practice holds to the Stephenson link reverse. Other differences are seen in such points as flange versus screwed joints—there are no screwed pipe joints on British ships. The winch engine is a comparatively simple type of steam engine, designed for ruggedness and durability rather than economy, and great variation in design is not to be expected, but there has been room for active design in such features as frame, cylinders, gears, etc., and any new manufacturing feature brings in interesting shop problems.

Some of the winch engines manufactured by Canadian firms for the United States Emergency Fleet were built in two types, double geared for heavy work, and single geared for lighter work. The frame of both these winches was of a simple heavy type, well ribbed, and of ample section to withstand the heavy stresses. A somewhat novel feature for winch engines was the provision of bored guides. The advantages of bored guides compared to plain guides are numerous. In the first place the guides are bored with a special jig, ensuring absolute alignment with the cylinder. Stress is more evenly distributed, and lubrication is easier.

The cylinders are of the usual D slide valve type, and are noteworthy mainly for the fact that they are side-bolted to the frame. This is a novel feature of winch-engine, and has the considerable advantage that one spare cylinder can be carried to be used for either right or left hand. Cylinders are planed eight at a time, mounted on special fixtures supporting two cylinders each, the cylinders are thus interchangeable.

An important feature of winch engine construction is the gearing. As the machine is intended for rough work with semi-skilled labor at the best, it is hardly necessary to have cut steel gears, and these are never specified. However, there are refinements in cast gears, and in the manufacture of spur gears in particular, by the use of a master gear to form the pattern; the resulting gear is almost as smooth running as the much more expensive cut type. The majority of winch engines are fitted with spur gears, this type being considerably easier to make than the herringbone type,



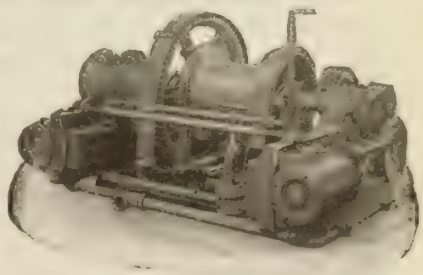
FRONT VIEW OF WINCH

and also simpler from the erection standpoint. However herringbone gears have several advantages over the spur gear, giving more even distribution of stress, smoother operation, and much quieter running, and are specified where the higher cost is not considered too great a disadvantage. And even if the winch engine is not intended to be particularly silent, anyone such as the writer, who has lived in a deck cabin overlooking one of the forward hatches, can speak with considerable force in favor of any device that reduces the clank and racket of the ordinary winch engine.

The piston is of the usual cast-iron type, pressed on to the piston rod and having a lock nut. The connecting rod is a solid forging, and to secure accuracy is broached with a rough and finish broach. Two ingenious jigs have been worked out to give absolute length and alignment for the eccentric rods, and the erection gang have in this way had their work simplified.

Winch engines are erected in batches of six or eight as shown in the illustration; after erection all winches are tested under steam, painted and shipped.

The future of shipbuilding in Canada is brighter than our pessimists who groan about comparative costs assure us, although costs are bound to be higher than in Great Britain. Through war experience our shipyards have gathered experience, and firms are ready for the auxiliary equipment. One of the secrets of Great Britain's success in shipbuilding has been the close co-operation between the shipbuilder and the manufacturer of auxiliary equipment—we now have this in Canada.



WINCH FROM STEAM SIDE

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Dry Docks on the Canadian Coast

ONE of the drawbacks of the St. Lawrence River and Gulf has been in the past the lack of suitable dry docks. Vessels of any considerable size meeting with accident in the vicinity of the river and gulf, could not get suitable dry docks to effect repairs in, the result being they had to be repaired temporarily and sent round to some American port for permanent repair.

This had the effect of making marine insurance rates heavy, and was one of the causes militating against the route. Happily this condition is rapidly being altered. At Montreal there has been for the past few years a floating dry dock capable of lifting almost any vessel coming to Montreal. This is now supplemented by a graving dock at Lauzon, near Quebec, claimed to be the largest in the world. Halifax has a good sized graving dock, and there are projected both at St. John, N.B., and Sydney, C.B., large dry docks of the floating type.

In the past millions of dollars have gone to the States for ship repairs which should have been carried out in Canada. This is a branch of the marine industry which not only brings profitable work to Canadian capitalists and workers, but saves money for shipowners and underwriters.

The Wooden Ship Controversy

THERE is a very considerable amount of murmuring anent the so-called failure of the wooden ship. Looking at the question in a dispassionate manner, it would seem that the wooden ship fulfilled her purpose in a satisfactory manner.

The object of the wooden ship was simply to supply a sudden emergency. She was not supposed to be a rival of the steel vessel any more than the concrete ship was. She was purely and simply a substitute, born of the necessity of getting tonnage, in any way possible. If some of the wooden ships have been found to require considerable overhauling after taking the water, the same can be said of the steel ship.

There are a large number of wooden vessels under construction in Canada at the present date, mostly for the French Government. These ships are for a special trade, and of a relatively small size. They are built with large cargo hatches, for rapid loading and unloading, and will, no doubt, be perfectly suitable for their purpose, and give good service. There are hundreds of wooden vessels in service all over the world giving good results year in and year out.

The disadvantage of the wooden ship is not as a ship but as a financial proposition. The same disabilities weigh against her as against her concrete sister. Further, when over a certain size, the difficulty of getting suitable timber arises. Dimensions being equal, she is of more displacement than the steel vessel. She requires as large a crew, and can carry a smaller cargo.

The emergency being past, it is safe to say that no more wooden steamers will be built. There will, no doubt, always be a field for wooden schooners fitted with auxiliary engines of the oil-burning type. These vessels are usually built in small yards on the coast, with local labor and no large organization to keep up. Under these conditions they can be built cheaply and operated profitably on coastwise services.

All things considered, there is little to be gained by heated discussion of the success or failure of the wooden ship. Ordinary economical laws will work to prevent the building of further wooden steamers of ocean-going size, and the same laws will operate to find a field of usefulness for those already built.

Ton for Ton Should Be Proper Basis to Adopt

British Are Well Aware of the Necessity of Seeing That Shipping Tonnage is Restored to Pre-War Basis—What French Navy League is Making in Way of a Request

ALTHOUGH little has come to the surface, there is keen discussion going on in many circles with regard to the disposal of the vessels taken from the enemy. The idea, and it is fair, is that these boats should be used to make good the losses caused by the submarine campaign. That is, if Germany sank a thousand tons of British shipping—she should be called upon to replace it with the same amount.

The whole issue is well dealt with by a correspondent of the London *Times*, who signs himself "A Past-President of the Chamber of Shipping." He says:—

Lord Inchcape, in the public-spirited and patriotic action which he and Sir Owen Philipps have taken with regard to the transfer of standard steamers now under construction from the Government to shipowners, has arranged for the vessels to be "distributed as far as possible on an equitable basis having regard to the losses sustained by the owners through enemy action." This is so obviously the fair course to adopt that I hope it will be followed by the Allies and America when they come to deal with the allocation of the German merchant ships in giving effect to the ton for ton policy.

In order to avoid misunderstandings and to prevent extravagant claims being put forward, it is highly desirable that we should have an authoritative statement of the tonnage possessed by each nation before the war, and the tonnage owned at the present time, after deducting losses sustained and additions made during the war. It is only by this means that we can obtain a clear conception of the position of the shipping industry throughout the world and can view the situation as a whole and in proper perspective.

This is all the more necessary as already claims have been advanced which have no justification in fact, as would immediately be seen by reference to the actual figures. For instance, the French Navy League is reported to have appealed to President Wilson, and suggested that the following steps should be taken to enable the French Mercantile Marine to be reconstituted:—

1. The allocation of 930,000 tons of German and Austro-Hungarian ships, in order to replace, keel for keel and ton for ton, the French vessels destroyed by the enemy.

2. The assignment of German coal to the French iron industry so that French shipbuilders may be on a footing of equality with foreign shipbuilders.

3. To render it possible for French shipowners to purchase immediately 1,000,000 tons of shipbuilding built in the United Kingdom on conditions acceptable to British shipowners.

4. To render it possible for French shipowners to buy immediately 1,000,000 tons of shipping built in the United States.

5. The authorization of American shipyards for the immediate construction of 2,000,000 tons of cargo steamers for French shipowners with permission to transfer the same to the French flag.

This appeal is made to President Wilson with a view to his supporting these claims at the Peace Conference.

I have nothing to say concerning suggestion 2, but with regard to the others, I think it is desirable to state the facts so far as they are available. The most reliable figures dealing with the merchant fleets of the world are those published by "Lloyd's Register of Shipping." I have taken out the particulars contained in "Lloyd's Register Book" for 1914, and made up the corresponding figures as far as possible to the end of October, 1918, and find that the steam tonnage owned by the principal Allied and neutral countries was as follows (for the purpose of comparison the tonnage trading on the Great Lakes of the United States is excluded):—

Flag	Gross Tonnage July, 1914	Oct., 1918	Increase or decrease	% on 1914 figures
British—				
U. K. ...	18.892.089	15,031,375	—3,860,714	— 20.4
Col.	1,631,617	1,828,561	+ 196,944	+ 12.1
Total .	20,523,706	16,859,936	—3,663,770	— 17.9
U.S.A.	2,069,637	5,116,521	+3,046,884	+147.2
Belgian ...	341,025	189,963	— 151,062	— 44.3
Brazilian ..	307,607	508,245	+ 200,638	+ 65.2
Danish	770,430	612,940	— 157,490	— 20.5
Dutch	1,471,710	1,030,137	— 441,573	— 30.0
French	1,922,286	1,536,730	— 385,556	— 20.0
Greek	820,861	259,174	— 561,687	— 68.4
Italian	1,430,475	989,575	— 440,900	— 30.8
Japanese ..	1,708,386	2,039,794	+ 331,408	+ 19.4
Norwegian .	1,957,353	1,414,927	— 542,426	— 27.7
Spanish ...	883,926	671,425	— 212,501	— 24.0
Swedish ...	1,015,364	810,489	— 204,875	— 20.2

Now it will be seen that while France is down 385,556 tons upon her pre-war total, the United Kingdom is down 3,860,714 tons. These figures speak for themselves and render it unnecessary for me to labor the point that, in dividing up the ships of the German Mercantile Marine and in arranging for the production and allocation of new tonnage among her Allies, this country is entitled to the lion's share. Everyone, I am sure, would wish to deal with our gallant French Allies in the most sympathetic and generous manner both as regards shipping and everything else. But we must be just to ourselves, and I am voicing the opinion of many of the members of the shipping community when I say that we fear this necessity is too apt to be lost sight of in some of our international arrangements.

We have already agreed to build some 500,000 tons of ships for France, to build (over a period of three years) some 750,000 tons for Norway, and to supply Italy with steel to enable her to carry out her shipbuilding programme. All this at a time when our own mercantile marine is just emerging in sadly diminished numbers and efficiency from the most colossal losses which it has ever experienced, and making heavy demands upon the whole of our shipbuilding resources with a view to its immediate reconstruction.

What is done cannot, of course, be undone, and whatever we have agreed to carry out for our Allies and for neutrals we must honorably fulfill, although upon the figures quoted I fail to see the justification for the agreements already made, but I feel compelled to enter an emphatic protest against any extension of these arrangements in response to extravagant appeals from any quarter whatsoever

Happily we have in Sir Joseph Maclay, the Shipping Controller, and Sir Thomas Royden, who will represent him at the Peace Conference, men of the highest ability and widest practical experience in shipping matters, and we should all be quite content to leave the question in their hands, confident in the equity of any arrangements to which they may agree. But in case they be over-ruled in a matter which is of such vital importance to us as a nation—more vital to us than to any other nation in the world—it behooves us to make sure that our heritage of the sea shall not be frittered away by concessions which are not justified by the facts. Let all claims be dealt with by the touchstone of the actual figures, and no one, whether ally or neutral, can reasonably ask for more.

Eastern and Western Canada Marine Activities

(March Correspondence)

MARITIME

The new warehouse on Reed's Point wharf, which has just been completed by the city for the Eastern S.S. Company, is a splendid building and will enable the company to handle its St. John business, both passenger and freight, much more expeditiously than in the past.

The building is one storey, 169 by 70 feet, the side walls are 13 feet high and roof is of truss construction, which leaves the entire floor clear for the storage of freight. A 70-foot freight drop has been installed and this will be operated by 7½-ton hoists. The roof is three-ply rubberoid roofing.

The offices, which are 110 by 25, are modern in every respect and are much more convenient than the old ones. These include private offices for the agent, immigration agent and custom house officer; a general office for the staff; an office for the checker; a general waiting room for the public; a detention room for the immigration authorities and lavatories for the staff and the public.

The building is heated by hot water and is electrically lighted, the wires for the latter being in conduits. The shed was built by Engineers and Contractors, Ltd.; the heating and plumbing was installed by J. H. McPartland and Son and the electrical work was done by J. W. B. Belyea; the whole under the personal supervision of the city engineer, G. G. Hare.

Grain shipments through this port for the present season have been very heavy, and it is expected the total for the season will reach 20,000,000 bushels. Up to the 14th there had been shipped 7,151,198 bushels of wheat, 3,693,921 bushels of oats, and 393,047 bushels of other grains; a total of 11,238,186 bushels.

St. John is to be the headquarters of what is planned to be the most up-to-date salvage and wrecking plant on the Atlantic Coast. Messrs. Thomas Nagle and R. W. Wigmore, M.P., have formed a company to be known as the Fundy Salvage and Wrecking Company and purchased the business of E. O. Leahay. Mr. Leahay had a complete outfit of scows, etc., but it is the intention of the new company to add a wrecking steamer, such as has been used by the British Government in the raising of torpedoed vessels, fully equipped with pumps, and go in for raising vessels which have gone down in water where it would be impossible to do anything to save them under the usual conditions. Included in the property purchased from Mr. Leahay was a dredge and this is being refitted for service, and the company expect to go after some of the dredging contracts.

Nineteen wrecks in various parts of the country were also bought, and if the price of iron warrants it, some of these will be salved during this coming summer.

Messrs. Nagle and Wigmore are two of the most energetic and popular of the younger business men of the city and have the reputation of succeeding in anything they undertake.

BRITISH COLUMBIA

Victoria — The biggest news along Victoria's waterfront last month was the announcement by Bayly Hipkins, Pacific Coast manager of the Foundation Company, that his firm had arranged to lease the Ogden Point assembling plant at Ogden Point in the outer harbor. This means that the entire fleet of twenty wooden steamships built here by the Foundation Company for the French Government will be completely outfitted at this port. It also indicates that a large part of the cargoes shipped away on these vessels will consist of the products of British Columbia, particularly lumber and paper.

The assembling plant was erected about two years ago by the Imperial Munitions Board on one of the big Dominion Government concrete piers completed shortly after the outbreak of the war. The plant became an important factor in the I.M.B. programme of twenty-seven steamers recently completed, most of the vessels built under this contract in Victoria, Vancouver, North Vancouver and New Westminster having been brought to the local assembling plant for their engines, boilers and other machinery and fixtures. The Munitions Board outfitted nineteen vessels at the plant in twenty months. The Foundation Company is under contract to the French Government to deliver all of the twenty-seven steamships now under construction by December 24 and as these vessels are considerably larger than those in the I. M. B. programme, it is obvious that the company is shouldering a difficult task. Preparations are being made to bring at least $60.000 worth of machinery from the company's plant at Tacoma, Wash., to complete the equipment of the local establishment.

Three thousand men are being employed by the Foundation Company at its extensive shipyards here, and the number is steadily being increased. The Cholberg Shipyard, under contract with Norwegian interests for the delivery of six wooden auxiliary schooners, has about 500 men on its payroll, and the first three hulls are rapidly nearing completion. The keels were laid September 9.

The Harbor and Marine Co., Ltd., the new shipbuilding plant organized by C. J. V. Spratt, president of the Victoria Machinery Depot, for the building of two 8,100 ton steel ships for the Federal Government, will soon be in a position to start active operations. The site at Hospital Point, in the inner harbor, has been cleared and a contract has been let for the construction of the plate shop. Mr. Spratt believes the orders for two steel ships are only the beginning, and that if the company is successful in getting the vessels put in the water in quick time more steel contracts are certain to follow. James Clark, of long experience in shipyards of the United Kingdom, is chief naval architect.

With the completion of the last of the twenty-seven wooden steamships built on this coast for the Imperial Munitions Board, it is interesting to note what has been done with the vessels built under this contract. The first eight to reach the Old Country were turned over to the French Government, which will use them between Marseilles and the Cameroons. Several of the other vessels will be used in the coal trade to ply out of Newcastle and other ports, and to serve in the English Channel routes. The tenth boat of the I.M.B. fleet to leave this coast, the War Tatla, reached England fourth. Leaving Victoria on October 9, the vessel made Balboa in twenty-one days, coaling there. The average speed was eight knots, although the average was about ten until the tropics were reached, when the firemen found it impossible to keep up the pace. From the canal a course was shaped for Port Royal, Jamaica, the passage taking six days. The War Tatla left for Newport News the day armistice was signed and reached the Virginia port with flags flying. The stretch to Liverpool was covered in eighteen days.

The twenty-seven steamers built by the Munitions Board have all been loaded under the supervision of H. J. Taylor, superintendent of cargoes for the British ministry of shipping. All the vessels up to the War Tyee, which was about the fifteenth to get away from this port, were loaded by the C. P. R., but the others were made ready for the sea by the ministry of shipping. The cargoes that these ships take to the United Kingdom total altogether approximately 27,000,000 feet of lumber, including box shooks, 2.000 tons of spelter and a quantity of salmon, the latter going only in three vessels. The loading was done at Victoria, Vancouver, New Westminister, Chemainus and Genoa Bay. Where only a small quantity of spelter was to be loaded it was found cheaper to bring it in cars from the mainland to Victoria than take the vessel to Vancouver. The value of the total cargoes is estimated at $810,000 for the lumber and $10,000 for the spelter.

Piers Nos. 2 and 3, the big concrete docks at the entrance to Victoria harbor, have been turned over to the Can-

adian National Railways, Ltd., (Canadian Northern Railway), and have become part and parcel of the Dominion Government's transcontinental transportation system. Active steps will be taken to hasten the completion of the docks in every detail, as well as of the other harbor improvements contemplated, so that Victoria may be prepared for a new era of ocean trade expansion as first and last port of call on the Pacific, with facilities to beckon trade from all parts of the world. Every possible freedom will be given to other lines desirous of using the piers. The plans for additional trackage at the piers and ferry connection with the slipway in the inner harbor will be carried out at once, so that direct communication between the ocean docks and the railway running to Patricia Bay, linked by ferry to the mainland, may be effected. Bonding warehouses will be provided, and any or all of the vessel's cargo will be bonded, if desired. This development is particularly significant in view of the announced intention of the Dominion Government to inaugurate a regular service between East and West via the Panama Canal in the near future. The piers were constructed by Grant, Smith & McDonnell, Ltd., at a cost of about $2,500,000. The work was completed about a year ago. The same company has completed on pier 2 a freight shed, 700 feet by 200 feet, with a ferry slip off the bulkhead north of pier 3, and the necessary trackage of nearly one and a half miles. The total cost of the shed, which is said to be the largest on the Pacific coast, was $218,000, while the track and ferry slip cost $65,000 A similar shed is now in course of erection on pier 3.

Victoria is pressing hard for the construction of a Dominion Government dry dock at Esquimalt, and the prospects of success are said to be better to-day than at any other time during the past four years. Victoria's plea is based principally on the ground that, if Canada is wise, she shall not neglect to protect herself on the Pacific Coast with adequate naval base facilities, and that Esquimalt is by far the most suitable place for the establishment of such a base. More than fifty years ago the British squadron in the North Pacific used Esquimalt as its headquarters on this side of the ocean, and until the Imperial authorities transferred control of the harbor to the Dominion, Esquimalt was looked upon as one of the most important links in the Empire's chain of naval stations. Since that time, however, little or no improvement has been made to the place, and the docks are too small and out-of-date to handle anything but the smaller type of vessels. During the past few years valuable repair contracts have been passed up at Esquimalt simply because the facilities there were inadequate. Another argument used by the dry dock agitators is that the British North America Act specifically states that a thoroughly up-to-date dry dock is to be maintained by the Dominion at Esquimalt. The long-promised undertaking to improve the dock facilities has been so long delayed that the original understanding on this point was almost forgotten, but the passing of time has made this contract no less valid. It is also contended that when Yarrows, Ltd., established themselves at Esquimalt a few years before the war and established a ship repair plant, the Dominion Government agreed to build a big dry dock on adjacent property. Strong pressure is now being brought to bear in an effort to have the work carried out, and the return of peace has made the situation somewhat more hopeful. At one time in the negotiations the Dominion Government attempted to give the British Admiralty sole responsibility. It is generally taken as a fact that the Admiralty will exercise a good deal of influence in the proposition when it is finally taken up. The Dominion Government attitude, as expressed by Hon F. B. Carvell, Minister of Public Works, is that the Esquimalt dry dock should be built under the terms of the Dockyard Subsidy Act, but those who are behind the present agitation claim it is up to the Federal authorities to finance the task, according to the long standing agreement and in view of the national need for better naval defence on the Pacific Coast.

The steamship Eurypylus, first of the Blue Funnel fleet to resume the prewar service between Liverpool and the British Columbia coast by way of the Panama Canal, reached here a few days ago.

The Canadian Pacific Ocean Services is preparing to break down the Japanese monopoly of transPacific trade and return to its old place of supremacy as cargo and passenger carrier. The Empress of Asia and Empress of Russia have been released by the Admiralty and are again on the old route between Hong Kong and Victoria and Vancouver. The Empress of Japan and Monteagle have been in service for some time, having been returned to private operation comparatively early. The Methven, formerly the Heliopolis, of about 4,000 gross tonnage, has been secured by the Canadian Pacific to augment the service, and the company is also having a steamship built in the United Kingdom that will be even greater than any other of its North Pacific fleet.

The Japanese companies, the Nippon Yusen Kaisha and the Asaka Shoshen Kaisha, are both planning extension of service.

Ross L. Osborne, formerly agent here for the Pacific Steamship Company, died recently in Seattle.—Charles L. Shaw.

CATALOGUES

Rochester Ball-Bearing Co. has just issued a new catalogue superseding Bulletin No. 10, issued in 1914; this new catalogue having several unique features to commend it. The prints heading each page are from actual photographs, and give a clear idea how the bearing and balls appear when assembled. The one-piece retainer used in their Standard Type is light, flexible, and durable. The method used is to form three fingers on each side, which are closed over the balls in the assembling operation; this allows ample play for balls to adjust themselves to the pitch diameter of races, something heretofore not accomplished except by means of an oval hole.

The Westinghouse Electric & Mfg. Co. of East Pittsburgh, Pa., has issued a complete catalogue in which all of their electrical supplies are listed. In compiling the catalogue every effort was exercised to make it of the greatest convenience to purchasers.

The catalogue is made up of 1,264 pages of description pertaining to the products of the company and a score of other pages contains a complete cross index, and index to style numbers, and a table of "Approximate Cost Multipliers," which enables one to figure the approximate cost of all supplies listed.

Although the book is called a catalogue, it contains a vast amount of information of a technical and engineering nature. Practical suggestions for the use of many kinds of apparatus for the transmission and utilization of electric power are given.

It is planned to issue this catalogue annually. The publication of this catalogue is quite noteworthy, as it is the first book of such a nature published by an electrical concern having the wide diversity of products sold by the Westinghouse Company.

NEW PUBLICATION

The double-helical speed-reducing gear, as used for stepping down from the high speeds of steam turbines to speeds suitable for ships' propellers, direct-current generators, large centrifugal pumps and fans, rope and belt drives, etc., was first introduced about twenty-five years ago by the late Dr. De Laval. This type of speed-reducing gear has subsequently been developed and refined by the several companies bearing his name, particularly for large size units, by the De Laval Steam Turbine Co., of Trenton, N.J.

That company has now issued a 32-page catalogue describing standardized geared turbine units for marine service. The gain in fuel economy of the steam turbine over the reciprocating engine is stated to be approximately 25 per cent. The geared turbine weighs about half as much and occupies less than a third of the cubical space required by the engine. It is also more accessible and easier to repair, the expense for supplies and attendance is considerably less.

The new publication describes the details of construction of turbines and gears and also various turbine-driven auxiliaries, including lighting sets, circulating pumps, boiler feeders, etc. A new development is the centrifugal pump for the continuous purification of the oil used in the turbine and gear bearings and on the gear teeth.

Some Important Points on Boiler Heating Surface

This Paper Read by Mr. G. J. Wells Before the Institute of Marine Engineers, London, Together With the Discussion, is of Great Interest to All Steam Users

A COMMITTEE has recently agreed that the size of the safety valves of the ordinary type required on each boiler shall be determined as follows:—

Area of safety valve in square inches = total heating surface of boilers in sq. ft. $\times \frac{1.25}{p + 15}$

where p is the working pressure in pounds per square inch.

Later it is laid down that all the steam generated when all the stop valves are closed and under full firing conditions must be passed by the valves without any undue increase of pressure. The author has always found that the amount of heating surface is but a poor guide to the steaming power of a boiler. A knowledge of its ability and capacity to burn coal is a much better index of the power of the boiler to meet the demand for steam. Holding this view, it appears to be an opportune moment to provoke an exchange of opinion upon the subject amongst the members of this Institution, and the following remarks may provide a peg for boiler users to ventilate their views upon the true value of heating surface.

Heating surface is the passage way for the flow of heat from the products of combustion to the water. It has been very generally assumed that the greater the extent of this heating surface the greater will be the efficiency of the boiler. It is analogous to argue that the number of blank cheques in one's possession is the true measure of wealth. Cheques are an expensive luxury if the balance at the bank is zero, and so is an acre of heating surface without a store of heat energy.

The heat energy of the fuel passes into the water partly as radiant heat and partly by conduction. Probably nearly one-half of the total energy reaches the water through the sides of the fire box. This proportion is modified by the thickness of the fuel bed and the character of the combustion. This will be evident when it is realized that the exposed surface and temperature are not much increased by thickness. Thus in the case of a thick fire there will be more heat carried into the flues than when the fire is worked thinner. The amount of radiant heat expressed in Br. Thermal units per square foot per hour is given by (Stefan's law) $-16 \times 10^{-10} (T^4 - t^4)$; where T is the temperature of the radiating surface, and to the temperature of the boundary expressed in degrees absolute Fahrenheit's scale. This formula illustrates the importance of a hot fire, and contains much of interest to the engineer in search of a low coal bill. The tube surface receives comparatively small quantities of radiant heat, as this surface is usually screened (or in a shadow) from the direct radiation of the incandescent fuel of the furnace.

The efficiency of the tube surface may be expressed thus—

$$E = 1 - e - (cl \div m)$$

where C is a constant, l is the length of the tube, and m is the hydraulic mean depth. It should be noted that the area of the heating surface is not so directly of importance as the way in which it is arranged. In order that E may be large, e—c-m must be large so that for any particular set of conditions m should be relatively small, and for tubes of circular section m = (d ÷ 48) feet, where d is expressed in inches. Hence small diameter tubes will be the more efficient. For example, a 6 ft. tube 1 in. diameter is equally efficient as a 12 ft. tube 2 in. diameter; the tube surface for the 6 ft. tube = 1.57 square feet, and for the 12 ft. tube the surface is 6.28 square feet, i.e., four times as much!

This is but another way of stating that for heating surface to be efficient it must be well scrubbed by the products of combustion on the one side, and by the water on the other side. Prof. Nicolson's experiments upon boilers, Jordan's experiments on tubes, Dr. Stanton's condenser experiments, and others all prove the validity of this conclusion. How often one hears the comment that "it is the wind that makes it so cold to-day." The scrubbing is so effective!

There are many types of boilers in actual use which differ greatly in the ratio of the heating surface and fire grate area, and yet, in spite of these variations, the recorded efficiencies do not differ much. In fact, it is often said that one type of boiler is as good as any other if judged solely by its efficiency as a steam generator, and an examination of many test records serves to make this statement appear quite reasonable. For example, compare the following:

	HS/GA	Coal per sq. ft. G.A. per hr.	Water from and at 212° per lb. of coal	Water evap. per sq. ft. Heating surface per hr. from & at 212° F.	Efficiency
Lancashire type	47.3	28 lb.	6.5 lb.	3.86 lb.	73.6 p.c.
Lancashire type	47.3	24½ lb.	9.5 lb.	4.91 lb.	76.5 p.c.
Lancashire type	47.3	24½ lb.	10.0 lb.	5.42 lb.	80.3 p.c.
Locomotive type	68.2	35½ lb.	12.2 lb.	6.20 lb.	80.7 p.c.

Here, if heating surface is all important, the locomotive had the advantage of over 46 per cent. over the Lancashire, but the efficiencies do not differ by much.

From the same records an average of 40 tests on Lancashire boilers, the average efficiency attained was 64.2 per cent., with a best of 73 per cent. As the result of an examination of 377 tests on many types, Mr. Bryan Donkin plotted a curve of efficiency and water evaporated per square foot of heating surface per hour giving mean values and maximum values, and this curve is a very suggestive commentary.

In all such tests where the necessary data has been recorded it is quite clear that the efficiency of a boiler, considered as a transmitter of heat from the gases to the water, is a constant quantity, and the variable factor is the furnace efficiency. Each variety of coal requires its own special treatment in order to obtain the best results. Variations in the air spaces between the fire bars, slight as they frequently appear, will make an enormous change in the resulting efficiency of combustion. There is some rate of combustion that will give the best results which must be determined carefully if the maximum efficiency is desired. In a word, it is imperfect combustion that brings down the boiler efficency.

The rate of combustion is usually given per square foot of grate, but for some years the author has felt that there must be some relation between the volume and form of the furnace and the weight of fuel that may be successfully burned, quite as important as the quantity burned per square foot of grate area. So far, however, there are too few experiments on this point recorded to enable any satisfactory deductions being made. Probably the most conclusive are the experiments made upon a locomotive at Altoona, which have been carefully analyzed by Mr. L. H. Fry, from whose figures the second table is made.

From the results the transmission efficiency varies from 78.3 per cent. to 79.7 per cent., with an average value of 79.1 per cent., and this between the limits of 36.5 and 168 pounds of coal per square foot of grate per hour! Hence it is clear that the boiler transmission efficiency is constant. The efficiency of the combustion varies between 90.8 per cent. and 68.6 per cent., and the varying rates per square foot of grate do not seem to affect the efficiency so long as the total weight burned in the fire box remains the same; consequently, the evaporation per pound of coal does vary much.

On this point some experiments by Mr. Isherwood are worth study. These

Area of Fire Grate	sq. ft.	55.5	39.5	29.8	55.5	39.5	29.8
Total Coal burned	lb.	2000	2000	2000	3000	3000	3000
Coal per sq. ft. Grate per hour	lb.	36.54	50.6	67.2	54	75.9	100.8
Furnace Efficiency	per cent.	88.0	90.8	89.7	81.2	82.5	81.2
Transmission Efficiency	per cent.	79.2	79.1	79.7	78.8	79.4	79.6
Boiler Efficiency	per cent.	69.7	71.8	71.5	64.0	65.5	64.6
Evaporation Efficiency	per cent.	66.4	68.4	68.1	61.0	62.4	61.5
Evaporation from and at 212° F. per lb. of Coal	lb.	10.20	10.20	10.35	9.33	9.30	9.13
Area of Fire Grate	sq. ft.	55.5	39.5	29.8	55.5	39.5	29.8
Total Coal burned	lb.	4000	4000	4000	5000	5000	5000
Coal per sq. ft. Grate per hour	lb.	72.1	101.2	134.5	90.1	126.6	168
Furnace Efficiency	per cent.	75.3	75.70	74.30	70.4	70.2	68.6
Transmission Efficiency	per cent.	78.6	79.4	79.1	78.3	79.2	78.8
Boiler Efficiency	per cent.	59.2	60.1	58.8	55.1	55.6	59.4
Evaporation Efficiency	per cent.	56.4	57.3	56.0	52.5	53.0	51.5
Evaporation from and at 212° F. per lb. of Coal	lb.	8.62	8.55	8.50	8.04	7.90	7.84

experiments contain a series in which the grate area was reduced, and the total coal burned proportionately reduced; two series are recorded which differed only in the amount of coal burned. The following results have been extracted:—

In the first set of experiments the whole of the heating surface was in use, the ratio total heating surface ÷ grate area = 88; and in the second set half the tubes were stopped up, where the ratio was reduced to 47. Notwithstanding this great change in the proportions,

	Combustible burned.		Evaporation from and at 212° F.		Evaporation per hour per sq. ft. of	
Grate Area.	Total	Per sq. ft.G.A. per hour	Total	Per lb. of Combustible	Grate	Heating Surface
	lb.	lb.	lb.	lb.	lb.	lb.
36 sq. ft.	711	19.75	6740	9.48	187	7.1
30 sq. ft.	535	17.82	5773	10.79	192	6.08
24 sq. ft.	424	17.68	4884	11.52	203½	5.14
18 sq. ft.	344	19.10	3963	11.52	220	4.17
13½ sq. ft.	257	19.02	2896	11.27	215	3.05
36 sq. ft.	282	7.84	3510	12.45	97.6	3.69
36 sq. ft.	473	13.13	5440	11.50	151	5.73
30 sq ft.	259	8.65	3210	12.20	107	3.38
24 sq. ft.	209	8.71	2436	11.65	101.5	2.56
18 sq. ft.	152	8.43	1895	12.29	105.3	1.99
13½ sq. ft.	109	8.08	1366	12.53	101.2	1 44

There were some experiments made upon water tube boilers which gave very similar results, and need not therefore be quoted. An examination of the results show that with each reduction of grate area the evaporation per pound of coal steadily improved until the last two experiments were reached in the first series, and here probably the volume of the fire box was too small to give the best results with the total weight of fuel burned, as in the second series the same grate areas when less fuel was burned a greater evaporation was secured. Unfortunately the records available do not give any information about the efficiency of combustion or the excess air admitted, etc., so that these experiments are of less value than the Altoona experiments quoted.

Some experiments made upon a locomotive boiler, divided into compartments in which coal and water are recorded, thus enabling the relative values of the fire box and tubes to be measured:—

the evaporation per pound is greater uniformly with the reduced heating surface. There are some sets of experiments of Isherwood which show this increased efficiency with a reduction in the tube surface, and it is pertinent to ask how the safety valve rule referred to at the beginning of the paper would answer in this case. Take the boiler as it was in the first series, then its heating surface was 792 square feet, so that the area of safety valves $= 792 \times \frac{1.25}{80 + 15} = 10.42$ sq. ins. or 3.64 ins. diameter. In the second case with half the tube surface then this formula would give the safety valve area $= 424 \times \frac{1.25}{80 + 15} = 5.580$; or 2.66 ins. diameter. (see page 70)

A rule which gives results of this character is one that can hardly be deemed entirely satisfactory, and points

	Coal burned per hour.		Water evaporated per hour			
Draught	Total lb.	Per grate area. Sq. ft. of grate area lb.	Total lb.	Per sq. ft. Grate lb.	Per sq. ft. Heat Surf. lb.	From and at 212° F. per pound of coal lb.
0.79 in.	476.2	53.9	3602	400	4.55	9.00
1.57 in.	743.0	82.6	5110	568	6.45	8.19
2.36 in.	923.7	102.6	6997	777	8.83	9.02
3.15 in.	1025.0	113.9	6990	773	8.82	8.12
3.34 in.	978.8	108.8	7984	887	10.08	9.71
	Coal burned per hour.		Water evaporated per hour			
Draught	Total lb.	Per sq. ft. of grate area lb.	Total lb.	Per sq. ft. Grate lb.	Per sq. ft. Heat Surf. lb.	From and at 212° F. per pound of coal lb.
0.79 in.	388.0	43.1	3278	364	7.73	10.06
1.57 in.	610.7	67.9	4240	471	10.00	8.27
2.36 in.	707.7	78.6	5619	624	13.25	9.45
3.15 in.	793.6	88.2	6252	594	14.75	9.38
3.94 in.	848.8	94.3	6886	765	16.25	9.66

to the desirability of returning to the notion that the maximum rate of evaporation depends upon the maximum capacity of the furnace to liberate heat energy. The area of the fire grate is surely the measure of the safety valve area.

A study of boiler performances includes an examination of the effect of change of velocity of the gases in the flues. A pound of coal requires roughly about 11 pounds theoretically for its complete combustion, but the practical impossibility of securing 100 per cent. efficiency of mixing of the products of combustion and the air it is necessary to supply an excess of 60 per cent. and upwards, depending upon the draught conditions. There is, therefore, usually some 20 pounds of flue gases per pound of coal burned which must pass through the flues. It is, therefore, clear that the flue area per square foot of grate will be some index of the velocity of the gases in the flues. The experiments on the locomotive boiler just referred to supply some information upon this point. An examination of the table shows that the rate of evaporation was very much increased from the tube surface as well as from the fire box plates. The second set of experiments, with half the tubes stopped, the velocity of the gases must have been nearly doubled.

The general results are most clearly shown by means of curves. A method sometimes adopted to increase the scrubbing action of the flues by the hot gases is the use of retarders and ferrules; the former is arranged so as to cause the gases to flow in a spiral path, whilst the latter throttle the entrance to the tubes, causing eddies and thus tending towards a more efficient contact between the tube surface and the hot gases. Isherwood's experiments give the results tabulated on page 70

These results are in accord with those previously cited, and the safety valve rule quoted appears to be quite inadequate to deal with the relief of boilers in its present form. There are many other boiler trials reported by Bryan Donkin, D. K. Clarke and others which confirm those given, but have not been quoted, as they do not add any fresh points. Water tubes would appear to be more efficient than smoke tubes, as arranged in the boilers, but in the absence of fuller particulars concerning the details of the combustion efficiencies in the several cases the superiority noted may be more apparent than real.

As bearing upon the question of the disposition of heating surface, two boilers described by Mr. Vaughan Pendred may be cited. In one of these heating water by means of gas burners, the flues were 7 inches long, ¼ inch wide by 5 inches deep, and the temperature of the gases after passing through was about 160 deg. to 180 deg. F. The second boiler was fitted with short tubes of about 1 inch outside diameter and 1 foot long, and some excellent results were obtained from it.

(Continued on page 70)

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"*

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

MORE CARGO PROBLEMS

THE last article opened up a few of the very important avenues which radiate from the gigantic subject—cargo stowage and protection, so we must now take a broader outlook and further explore that branch of a junior mate's education.

There will always remain a great number of harbors throughout the world where loading and discharging merchandise is no easy matter. For instance, take any roadstead, and naturally you say, "What is a roadstead?"

A roadstead is a harbor where the vessel anchors, and lacks that position of safety which a dock affords. In many cases the vessel is in more danger than if she were at sea. The medium of loading and discharging is carried out by barges, batteaux, rafts, junks, or other small craft in keeping with the foreign country you may be in.

The responsibility for these barges falls on the mates to a great extent, so we become interested, first of all, in their moorings. In some cases the ship provides the barge moorings, in fact such a condition is most usual, and second-rate hauling lines are generally cut up for the purpose.

Barge Moorings

Whether the ship is anchored in a tideway or answers to the wind and sea of an open bay, the barges at the fore hatch and the barges at the after hatch are always in most danger of breaking away, through their moorings having the least spread.

Therefore, the two best places for the bow ropes of the fore hatch barge are a lead through the towing pipe on the ship's stem, or if the anchorage is very safe, make fast to the vessel's chain. The point is to get the mooring on a level with the barge, as no craft will stay fast to another with up and down moorings. With the after hatch, have the same end in view, and on both these barge moorings attach bridles—short pieces of handy-sized rope to trice the moorings up in safety and keep them from chafing when not in use.

Winch Waste Pipes and Scuppers

There are still many steam tramps which do not return their winch exhausts to a tank in the engine room, so where the hot water and steam are simply blown over the ship's side be careful that no damage is done to life or property in the barges. In the same respect, hang small bunker hatches or bag devices over your scuppers to prevent them from doing similar damage. Should bathroom or closet pipes need attention see to that also, as you cannot take too much care of your merchandise, and the barges are at the mercy of all these nuisances, as many strangers to roadstead work find out to their sorrow.

Where the barges have considerable movement in rise and fall. have chafing mats on the moorings where you notice it is necessary.

Making a Lee

It frequently happens that a stormy day prevents the barges from mooring on both sides of your vessel, and the question arises, "Why not make one safe side," or, as sailors call it, "a lee." This can be done providing the ship is only anchored forward. If in a tideway and your draught anything approaching an even keel, just break the vessel's sheer with a little helm and manoeuvre with her till you can trust her to stay, say about two points away from her natural riding position. Of course keep the helm at whatever angle she may dictate. The swifter the tide the less helm is required —sometimes half a turn of the steering wheel will suffice. The smooth water on the lee side thus made will allow of the loading or discharging being carried out in comparative safety, the ship's weather side acting as a breakwater.

If in an exposed anchorage where the ebb and flood of a river is absent, but the swell of the ocean or the choppy sea of a coast is present, the helm will not do the trick, but proceed thus in such a case if a lee is required for cargo working.

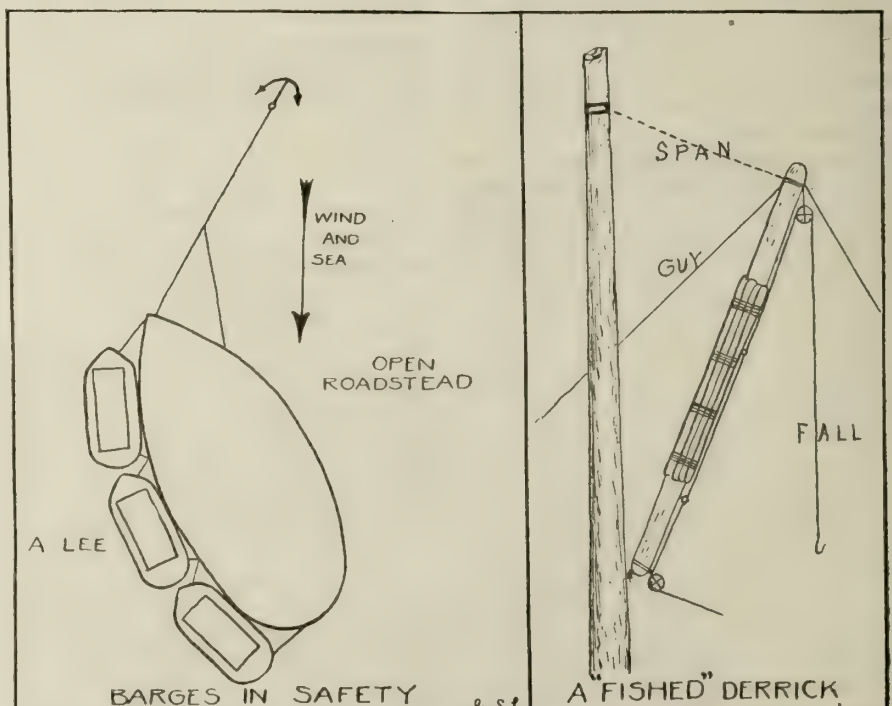
Anchor Chain Bridled

Take the heaviest wire rope (the towing wire) and lay aside the shackle, as the big eye and stout thimble will allow of a rope lashing, which in this case is preferable to a shackle being used. Lash with ½ in. rope, the eye of this wire to the anchor chain over the bows, but leading it through the mooring pipe in the fore well-deck on the side of the ship that you wish to be made the weather side. When the lashing is made secure let out about 10 fathoms of slack wire and then belay to the bitts and put a stopper over all to prevent slipping. Then ease the windlass brake and let the ship put a medium strain on the wire rope. Your vessel will then act in the manner shown in the accompanying diagram and provide a quiet side for the barges.

Sailors at the Winches

In some of the world's finest harbors the port authorities will not allow the ship's men to drive the winches—the procedure generally hinges on the local compensation laws in regard to accidents and the high efficiency of some stevedore gangs. Notwithstanding this condition, however, the young officer in our Canadian merchant marine will soon find himself in dozens of ports where the members of the crew must drive the cargo winches. Then, of course, the junior mates must assume the responsibility.

When trying out a new crew, it is well to lecture them on the preservation of winches and show them by going through the antics yourself. Sailors are no different to other human atoms, some have initiative and others have no claim to that essential, and the one with no claim may jump at a winch and just know enough about it to smash it. Jack must be told the dangers of opening a winch valve without first opening the cylinder drain cocks. He must also be conversant with the single and double clutches and levers, and he must know enough not to give a winch any steam whatever on the reversing gear until he is sure the load requires it. In many cases the winch



will reverse with the load itself if the lever is pulled over. A good winchman is next in importance to a good quartermaster.

Heel Blocks, Gins, Falls and Guys

The derricks in the average steamer need to be nursed too, for these heavy spars get a great deal of unavoidable abuse in the operation of loading and discharging. The drawing herewith shows the transfer method of using double derricks for barge or dock work, but the main thing is to have all the gear in splendid shape, everything twice as strong as it should be, for the strains are frequently out of all proportion to what one would expect. A winch will be brought up "all standing" when a fall hook catches a 'tween deck combing, and the old derrick will bend in the middle like a barrel hoop. There are other daily happenings which play havoc with the cargo gear. Should a derrick actually show signs of collapse "fish it" at once. Fishing any spar is simply adding to its strength by lashing a number of splints to its weak part and thus preventing its sag when tortured with a heavy weight. In the drawing I also show a fished spar.

In some steamers a heavy-duty derrick is carried which can be shifted from one hatch to another and has its own heavy guys, falls and topping lifts—named in ordinary derricks, spans. Both the topping lift and raising and lowering falls are in purchase formation, generally three or four-fold blocks and the winch part, instead of coming down under the derrick or boom, goes aloft and leads down the ship's mast. These portable derricks are generally of steel and a properly built shoe takes cares of the heel. The shoe is lashed from four directions. The writer was in one tramp boat which had a permanent shoe at the main hatch for such a derrick, as extra weights are generally carried in the main hatch only. Should you ever have to rig up something of this nature, make sure you "tom up" the main deck under the shoe which holds the derrick heel in safety, otherwise your deck may buckle.

Transfer Whips or Falls

In the illustration you will notice that derrick A brings the cargo out of the ship's hatch, whilst the derrick B plumbs it into a barge or on to a dock. The winchmen in all cases of this kind must watch each other's movements as well as listen to the voice or signal by whistle of the stevedore's man. In some instances the fall hook from derrick B is not put in place till the weight comes to the level of the hatch combing, but where the work goes along speedily the two falls are shackled into a good chain, which terminates in a 5-ton hook, and thus the moments that would be used up in hooking and unhooking at the hatch are turned into real constant grinding. In the transfer system the boom guys are fixtures.

Lubrication

Oil and grease play their part in loading and discharging cargoes. During the noon lunch hour it is well to have the boatswain hoist a man up to each gin on the derrick ends and oil the pins and goosenecks. The heel blocks at the jaws or the booms must be given the same treatment, and the wire falls—sometimes termed whips or runners—are treated to a dope of black lead and tallow, which is the very life of steel flexible wire that has to stand the chafe of winch drums.

Where the chain falls are used the revolving body of the average winch is about the right circumference, but it is usual where wire falls are used, to put hardwood slats against the bare iron before attaching the cargo gear. Every winchman must have a full oil-can at his hand, and he must also know where the out-of-the-way holes for oil are situated, for the life of a winch depends on oil and common sense.

Small But Important Gear

A constant examination of cargo slings, whether they be rope stroos or chain snotters, is a vital point. Where small parcels are in evidence the rope net or canvas square may be used, in each case these handy devices can pick up from 1 to 1½ tons of material which is not adapted to the ordinary slings. As many of our aspirants to success in the new merchant marine have only been accustomed to elevator legs and grab-buckets in cargo work, the writer has thought fit to mention the above particular in minute detail, thereby showing the large field of enterprise wrapped up in the handling of cargoes.

Hold Work

In preparing holds for cargo it sometimes happens that a ballast tank has to be examined and a man-hole cover removed for that purpose. In all such cases remember to use a windsail to change the air in the tank and also to use a Davy lamp in case of foul gas being present. These objectionable fumes are also created when men are painting in confined parts of the vessel, in which case the victims will show in the initial stages of the poison, an idiotic attempt at stage acting both in speech and manner. In some cases men have simply fallen dead on their entry to tanks which have been long closed, so always be on the qui vive.

Bag Cargo

Where rice, cane or beet sugar, or bag grain are coming on board, it is well to see that the natives live up to their stevedore contract and sew up all bags that are bleeding on arrival in the hold, otherwise the trouble will loom up at the discharging port. Where consignments to different consignees require divisional markings, it may be done by old tarpaulins, thwartship lines of rope yarn, or bamboo matting. Should iron or steel goods or odd cases require similar treatment the paint brush is more effective—just a dab of black to mean one particular port or man, and a dab of red to mean something else, and so on. Besides this crude procedure the junior mate keeps a rough cargo plan in his pocket-book to be shown every evening to the chief mate and entered on his chart.

Refrigeration Holds

These compartments, once sealed, are under the observation of the engineer through his temperature gauges, but you must peep into them now and again to see that the stowage is proper.

Liquor Consignments

In all ocean routes the carriage of booze consignments is considerable, and in many instances there is a constant worry till the firewater is finally discharged and sealed up in a box car. In the Atlantic trade it was comical to be running from Glasgow to Portland, Maine (an old prohibition state) with part cargoes of whiskey. No matter how well guarded the holds were in Glasgow and how well locked the compartments were on the voyage, the writer would be frequently called into the Customs sheds on Portland wharf and hailed with the mysterious cry, "another broached case, Mr. Mate." Bear in mind that the stuff spoken of was passed through Maine territory in bond, its destination being Toronto and Hamilton, Ontario. The case is cited just to show once more how far-reaching the cargo protection game goes.

Protection at Sea

To ensure the cargo against inroads of sea-water on the passage, it is well to inspect frequently such places as the mast-coats, ventilator shafts and cowls, and the combings of all hatches, houses and deck structures. Just as an incentive to fostering the protective line of thought—which is a sailor's greatest asset—let me put just one query.

You are bound to St. John's, Newfoundland, in the late spring, and on a moonless night you find your ship amongst growler or floe ice. What would you do on your own initative, before the chief mate or master had time to tell you?

Answer—Ask permission to pull the patent log aboard, and see that free access could be had to the bottom of the fore-peak.

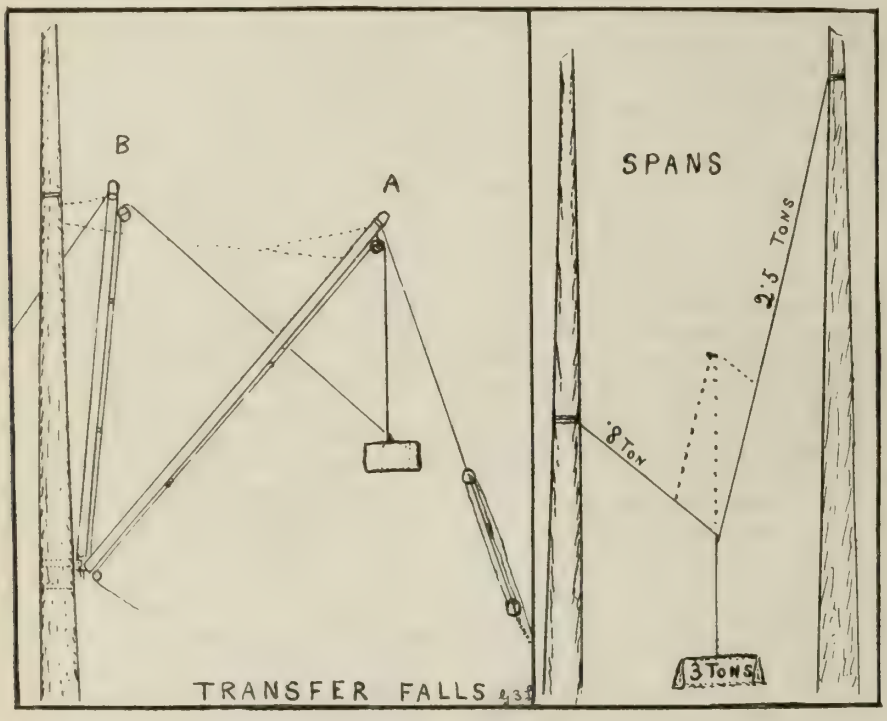
The first performance shows that you are quick to save property, while the second manoeuvre puts it beyond a doubt that you have a line of thought radiating from the first essentials—preservation of ship and cargo from leakage.

Never, until you visit a ship's fore-peak when crawling through an ice field, will you realize what a thunderous din and terrific strain is on the vessel. Hence the precaution and need of a smart report to the bridge should the ship show signs of weakness in the nose.

Further Reference to Illustrations

Spans come into play now and again both on steamboats and windjammers. The more your spans hang to the perpendicular the better will be the distribution of weight. If spans were rigged up in the same manner as you place a

jumper stay—that is, almost parallel with the ship's rail, then the subsequent strain on such spans would be positively dangerous and impracticable. The parallelogram of forces is illustrated to show you how it is possible to find out approximately what strains may be on your spans or derricks. The problem marked 3 tons is worked out by extending the centre of gravity line upwards, then drawing proportional lines parallel to the lines of tension—the spans. The diagonal dotted line assume to represent the 3 tons, then in the same proportion the small dotted line will show the tonnage on its corresponding span, in this case .8 of a ton, and the long dotted side of the parallelogram will measure



in work 2.5 tons. In windjammers use a cock-billed yard or jury spar to throw cargo on to a dock.

A good illustration of how weight becomes aggravated when pulled or pushed at variance with its pet hobby—getting to the centre of the earth—is shown when you carry a grip to the depot. Now it is customary to carry the grip by your side, nearly parallel with the line of the body. But to get an idea of the weight of the same grip when held away from the side of your body just try it, and then you will readily understand why weights multiply themselves in different forms of suspension.

Now let us work out the tension on the span of the fished derrick and the thrust on the boom itself. To a sailor, tension is pull and thrust push. Assume a load of 3,000 pounds on the hook of the fall. Now take your parallel rulers and carry a line parallel to the fall and place it inside the triangle which the span, boom, and mast form. Draw this line from any point on the span to any point on the derrick. Then with your dividers or compasses measure that line in inches and remember that your measurement equals 3,000 pounds. The part of the span, and the part of the derrick included in your new triangle are proportionally related to the 3,000 pounds. That is clear, is it not? Work this out from the diagram and your answer will come something like this. Weight on span 1,250 pounds, weight on derrick 2,750 pounds. To lower that fished spar until the span and the spar were equal in length would divide the strains. With your derrick apeak the weight becomes mostly thrust on the heel. With your derrick short and low the span has most of the work to do.

In studying such work as this, kindly remember that Canadian vessels and Canadian crews will be judged in the far-off parts of the globe in proportion to how their cargoes are handled and preserved—for that is the main function of the merchant marine, and the great hope of our new fleet is the young man.

RECORD ORDERS FOR LINERS

The current number of "The Compendium," published recently, announces a remarkable list of new and released shipbuilding contracts, which British shipyards have recently booked, and with which they will start their post-war trade. These contracts, of which the essential details are furnished, represent probably the largest batch of orders ever given out at one time, and include unusually numerous units for the great liner corporations. Some of the orders, it is explained, represent "released contracts," that is to say, contracts which were placed during the war, but could not be started without the Controller's permission, now granted, but these, together with the fresh contracts placed, make up a list which totals considerably over 100 vessels, representing a very large tonnage. One combination alone, that of the Ellerman-Bucknail Line, has ordered over 50 steamers on the Northeast coast, while the Cunard Company are building eight large liners, the British India Company nine, the Union Castle Company two, Messrs. Elders and Fyffe four, the Shaw, Savill and Albion Company three, the Donaldson-Anchor Line and Messrs. Donaldson Brothers, six; Messrs. Larranaga Brothers, two; the Commonwealth and Dominion Company, two; the Consorzio Veneziana of Italy, two; the Banco Italia, two; the P. L. & M. Company, eight and several smaller vessels; the Eagle Oil Transport Company, two tankers of 13,000 tons, while seven other firms are recorded to have contracted for from one to four cargo boats or steam colliers each, or sixteen in all.

What with the orders now placed, and the enquiries which are known to be in hand, there will be no lack of work for our shipyards, says this authority. Already some of them have two years' work on their books, and are declining to accept more business at present. There is no need to fear that the extensions and developments carried out during the war, or yet to be completed, have been overdue. Every building berth promises to be occupied for two or three years to come, and if only labor will settle down to steady and contented work the shipbuilding trade promises to experience a run of unqualified prosperity. It is on the attitude of labor, more than anything else, that the fate of the shipbuilding trade now depends.

CHINESE SEAMEN ON BRITISH SHIPS

At a meeting of seamen held at the Union Hall, Cardiff, yesterday, Mr. M. Tearle presiding, the following resolution was passed:

"The seamen now assembled in the port of Cardiff protest against the continual employment of Chinese in British ships and pledge themselves not to join any ship on which Chinese are employed, and having regard to the fact that there are now in this port over 1,400 unemployed seamen they call on the Government to take the necessary steps to repatriate all Chinese seamen, and demand that the Admiralty fulfil their agreement dated November 3, 1915, and employ only British or British colored seamen.

"We also draw attention to the fact that thousands of men who, pre-war, were not sailors, having served in the navy, are now seamen, and on demobilization are joining the merchant service, and that the only means of meeting this influx of labor and of finding employment for those who have proved their worth to Britain is by allowing them preferences over the alien Chinese."

The resolution was carried unanimously, and copies were forwarded to the Admiralty authorities, the Ministry of Shipping, and the National Maritime Board.

Thomas W. Pangborn, president Pangborn Corporation, has been elected a director of the Marvland Surety & Trust Co., Hagerstown, Md.

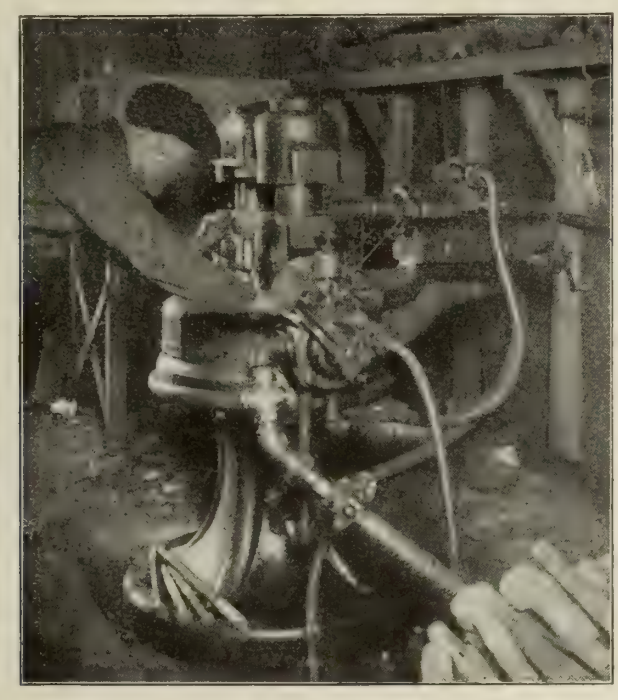
PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

BOLT HEADING IN SHIPYARD

The illustration shows a No. 5 Leyner bolt-header at work in the shipyard of Fraser, Brace and Co., of Montreal. The development of the Leyner sharpener as a bolt header for shipyard work has been comparatively recent, but rapid. The principle of action is simple; the bolt is heated, held under the clamping crosshead, and the head is rapidly forged by the horizontal hammer shown on the right of the illustration. The bolt-header is operated by compressed air and is thus entirely self-contained; further, no special foundation is required. One lever controls both clamping crosshead and forging hammer, hence the machine is remarkably easy to operate.

Performance of representative shipyards in Canada and the United States



LAYNER SHARPENER USED AS LEADER

show that the output of forged bolts varies between 200 and 300 bolts headed per hour, which compares very favorably with hand forging; in fact, according to the manager of one Canadian plant, the Leyner bolt header, with three men, is turning out more bolts forged than six men were able to turn out by hand labor.

VOORHEES RUB-STEEL VALVE

Owing to the isolated nature of steamship operation during long journeys it is of the utmost importance that the engineering equipment be of first-class quality, assuring continuous operation under the most severe service. Valve maintenance is an essential detail of engineering efficiency. Leaky pump valves are frequently a source of great annoyance to the operator, and expense to the owner.

The Voorhees Rub-Steel Valve is made in four different grades. Standard, for service under moderate temperatures up



RUB-STEEL VALVE

to about 160 degrees. Superhot, for use on equipment adapted for hot oil, etc., where temperature exceeds 160 degrees. Special soft, for low pressure water service, slightly gritty fluids, etc. Red condenser, for service under specially severe conditions. These valve discs are made in a large variety of sizes and for any particular purpose. As the name implies the valve is made of a combination of rubber and steel; the rubber composition attached to the central steel disc by a special electrochemical process known as the Elchemco process. The steel plate adds great strength to the valve and prevents distortion under high pressure, while the rubber assures perfect contact with the seat. This construction increases the average life of the valve, eliminating the possibility of destruction by forcing through the grating or breaking up into pieces. When one side becomes worn the valve can be reversed without dressing. Reliable service is an economic necessity in steamship operation.

DURABLA PACKING

Flange joints in piping installations are factors in engineering that demand particular attention, especially where the system is operated under varying conditions of heat and cold, and the consequent expansion and contraction of the metal, and the condensation of the steam and vapors. Economy should never displace efficiency unless this efficiency means economy.

Durabla packing is made of a combination of asbestos and the best binding materials, which will not pulp around the joint. It is unaffected by temperature change, or the action of oils, chemicals, hot water and liquids, and gives exceptional service for steam and gas engine operation. It has a peculiar ability to withstand shock or vibration, which makes it very effective for steamship service. It is made in sheet or gasket form and will withstand temperature of 1,000 degrees and pressure of 300 lbs. without signs of destruction, and will not deteriorate when kept in stock for a lengthy period.



DURABLA PACKING

Unemployment Figures.—The Employment Service of the Department of Labor reports that for the week ending February 22, employment returns were received from 1,561 firms in Ontario, Quebec, New Brunswick, Nova Scotia and Prince Edward Island. The total number of persons on the payrolls of these firms February 22 was 168,137, and the number of persons anticipated to be on the payroll on March 1 was 166,806, a reduction of 1,331, or .791 per cent. Reports from trade unions for January 31 which have been received by the Employment Service indicate that while there was a considerable volume of unemployment on that date—3.9 per cent.—the country is still far from the hard times of the winter of 1915, the percentage of trade union members reported unemployed on December 31, being 8.7.

MARINE NEWS FROM EVERY SOURCE

Quebec.—The National Shipyard Corporation, having vast plants at Three Rivers, is at present working on the construction of ten large wooden vessels. Eight hundred men work there, and it is expected the vesssel will be launched by the end of April.

Montreal.—The Sincennes-McNaughton Co., of Montreal, has purchased from the Montreal Transportation Company the barges Augustus Condor, Dorchester, Dunsmore, Dakota, Kingston, Lapwing, Muskoka, Selkirk, Valencia and Winnipeg. This gives the Sin-Mac Company twenty-three barges for the Lake Ontario and St. Lawrence trade.

Bridgeburg.—At the shipyard of the Canadian Allis-Chalmers Company the first boat of the "War Weasel" type completed in the Bridgeburg yards was launched. George W. Chase of Buffalo had charge of the ceremonies. Three boats have been under construction at the yards and the second one is nearing completion. Work on the third ship has been stopped, but officials deny rumors that the plant is to be shut down.

Pt. Colborne.—There is no ice to be seen off the harbor at Port Colborne and it is expected that navigation will open this year two weeks earlier than in former years on account of the open condition of the lakes. The "Sir Trevor Dawson" and the "Hagerty," two steamers which have wintered at Port Colborne, are now being fitted out for the commencement of the season, the engineers and oilers having arrived to take charge of preparations for the season.

Mayor McBride, just back from Ottawa, says his interview with Hon. F. B. Carvell in regard to Port Dover harbor improvements left him disgusted. "The work will not be included in the estimates. It is a straight throwdown to Brantford and the other cities and towns interested." Mayor McBride stated he was going to Galt and Kitchener and Waterloo with the intentions of arranging a conference, to be followed by big indignation meetings in every city and town in the district.

Welland—A second Welland fire broke out at shipyards in the evening between 7 and 8 o'clock recently. The machine shop, a galvanized iron building, with sheeting underneath, was destroyed, together with its contents, including lathes, drills, ship fittings and tools. The building was worth about $3 000. H. M. Balfour, of the British American Shipbuilding Company, states that an accurate estimate of the company's loss cannot be made at the present time, but he thinks it would be in the region of $10,000.

Vancouver.—After three hours' discussion the special meeting of the Metal Trades Council decided to accept the offer placed before them by J. J. Coughlan on behalf of the Coughlan Shipyards for the appointment of a committee of six to take charge of the yard operations. This decision of the Council is an important one, and means that the labor difficulties in connection with the Coughlan Steel Shipbuilding plant are over, at least temporarily, for in the offer made by the firm it is proposed that this committee should act for sixty days, during which time the scale of wages will be paid as prevailing in other yards operating under the Robertson agreement.

London.—In order to maintain mercantile supremacy of the seas Great Britain shipping interests are contemplating converting a large part of the British merchant ships into oil-burners. Only last Friday it was announced here that a great oil combine is being formed in which Roval Dutch and other interests will get control of the Mexican Fagle Co. One of the chief reasons why the British oil interests are seeking to gain control of Mexican and other outputs is in view of the conversion of a large part of the mercantile fleet. It was also stated that as soon as the Government releases such vessels as the Aquitania and other liners they will be converted into oil-burners. The high cost of coal and serious miners' strike issues, it is asserted, have done much to drive shipping interests to the use of oil in order to regain and hold ocean supremacy. At the present time it costs ten dollars to put a ton of coal in a ship's bunkers in British ports.

Victoria.—With four hulls at the Foundation yards ready for the commencement of caulking operations, the edict went forth that a start would be made in plugging up the seams, and the caulkers were told off to warm up for the occasion. Instead of getting down to business, however, they put in a demand for an increase in wages, which the company was not disposed to consider in view of the fact that the wages paid to all crafts in the yards comply with the provisions of the Robertson agreement, to which the Caulkers' Union is a party. Under the Robertson agreement the caulkers are entitled to $7.70 per day, and with the revision of the wage schedules, according to the increase on the cost of living the daily wage of a caulker has been boosted to $8.08. The caulkers, however, demand that they be paid a scale of $8.50. Apparently the men of the other crafts are not in sympathy with the caulkers and there seems to be a lack of unanimity on the score of a raise among the caulkers themselves.

Word has been received by the Dominion Shipbuilding Company of Toronto, that the Dominion Government has decided against placing any orders for vessels with Toronto firms. This company was represented at the recent conference at Ottawa, when Sir Thomas White and other members of the Cabinet were asked to assist the local shipbuilding concerns by placing orders for ships. In a letter to Mayor Church of Toronto, a representative of the company writes: "I am terribly disappointed to have to tell you that after all our efforts re shipbuilding industry here, I have a wire from Ottawa indicating that not an order for a single ship is going to be given. Two ships were all our clients wanted, and we had very large financing in the United States arranged, the parties placing their confidence and making the advances on the fact that the Government was expected to place an order for ships.

"This financing would have covered enough money to carry the business on securely for over a year, but since our own Government does not have confidence enough to place two ships, the foreign lenders are backing out. It is only to be expected.

"The company had to let 150 men go the other day, and they will have to let others go gradually as we see nothing else for it.

"It is particularly grievous with our returned men. One of our returned men came back just the other day. He had been wounded three times. I gave him a special letter down to the works and they took him on, but I told the man himself the position we were in and that unless the Government came through we were very sorry to say that his job and that of the others would be very temporary."

Work in Progress in Canadian Shipyards

A Record of Work Recently Completed or in Process of Completion — Principal Features of Specification—Approximate Launching Dates—Vessels on Order

BRITISH COLUMBIA

YARROWS, LIMITED, ESQUIMALT, B.C.
Occupied on marine repairs and marine castings.

H. VOLLMERS, NANAIMO, B.C.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
Building five wooden steamers for French Government. Three of 3,500 tons for Belgian interests.

B.C. CONSTRUCTION & ENG. CO., POPLAR ISLAND, NEW WESTMINSTER, B.C.
Four wooden vessels, 1,800 gr. tons, 2,800 tons d.w.

NEW WESTMINSTER MARINE CO., FT. OF FURNESS ST., NEW WESTMINSTER, B.C.

STAR SHIPYARD CO., NEW WESTMINSTER, B.C.

J. A. CROLL, PORT ALBERNI, B.C.

PACIFIC CONSTRUCTION COMPANY, COQUITLAM, B.C.
Building two wooden steamers of 1,500 tons for French Government. 3,000 ton steamer for Belgian interests. One steamer for Greek interests.

C. E. BAINTER, PRINCE RUPERT, B.C.
Several wooden fishing steamers, for undisclosed interests.

GRAND TRUNK DRYDOCK SHIP REPAIR CO., LTD., PRINCE RUPERT, B.C.

S. A. MOULTON, PRINCE RUPERT, B.C.

BRITISH-AMERICAN SHIPBUILDING & ENG. CO., VANCOUVER, B.C.

JOHN COUGHLAN & SONS, N. VANCOUVER, B.C.
Building four 8,100 ton steamers for Canadian Government. Four 8,800 ton steamers same as "Alaska."

THE FOUNDATION CO., VANCOUVER, B.C.

FRASER VALLEY SHIPBUILDING CO., VANCOUVER, B.C.

GRANT, SMITH & CO., VANCOUVER, B.C.

HARRISON & LAMOND, SHIPBUILDERS, LTD., VANCOUVER, B.C.

LYALL SHIPBUILDING COMPANY, N. VANCOUVER, B.C.
Building eight wooden steamers of 1,500 tons capacity for French Government.

W. R. MANCHION, VANCOUVER, B.C.

STANDARD SHIPBUILDING CO., VANCOUVER, B.C.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
Number of small vessels being constructed at total value of $300,000. 4,500-ton floating drydock, 352 ft. long.

VANCOUVER SHIPYARD, LTD., VANCOUVER, B.C.

THE WALLACE SHIPYARDS, LIMITED, NORTH VANCOUVER, B.C.
Building four steamers for Dominion Government; two of 4,300 tons deadweight and two of 5,100 tons deadweight.

CHOLBERG SHIPYARD, VICTORIA, B.C.
4 1,500-ton vessels for Norwegian purchasers. Keels laid Oct. 4th, 10th and 25th respectively.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
"Teco," 300 tons. Motor coasting freighter fitted with Bolinder 200 h.p. Built for William Mason Rooke.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.

NORTHERN CONSTRUCTION CO., VANCOUVER, B.C.
5 1,500-ton d.w. compound engines, 12 x 24 x 16 stroke, twin screw water tube boilers, 2,000 sq. feet heating surface. Building for French Government.

WESTERN CANADA SHIPYARDS ,LTD., VANCOUVER, B.C.
"War Nootka," Jan. 4, 1918, 3,080 tons (machinery installed at Ogden Point Assembly Sheds).
Six wooden freight steamers, 250 ft. h.p., 259 ft. o. a., 43½ ft. extreme breadth, molded 42½ ft., 25 ft. molded depth., draft 22 ft., 2,800 tons d. w., for undisclosed interests. "War Nootka," launched January 4, 1918. "War Selkirk" launched March 6, 1918.
"War Tatla," "War Casco, "War Chilkat," "War Tanoo," 4 standard vessels now under construction.

CAMERON-GENOA MILLS CO., VANCOUVER, B.C.

THE FOUNDATION COMPANY, VICTORIA, B.C.
Building twenty wooden steamers of 3,000 tons deadweight for French Government.

CLARENCE HOARD, VICTORIA, B.C.
Wooden car barge for C.P.R., Jan., 1918.

VICTORIA SHIPBUILDING CO., VICTORIA, B.C.
Constructing wooden ships for British Govt., 3,500 tons each.

NEW BRUNSWICK

C. T. WHITE & SON, LTD., ALMA, N.B. (Office at Sussex, N.B., also.)

JAMES X, LENTEIGNE, LOWER CARAQUET, N.B.

INTERNATIONAL SHIPBUILDING CO., NEWCASTLE, N.B.

EUREKA SHIPBUILDING CO., NORTH HEAD, N.B.

PORT COLBORNE BUILDING & REALTY CO., LTD., REXTON, N.B. (Head Office, Welland, Ont.)

GRANT & HORNE, ST. JOHN, N.B.
Two wooden cargo steamers, "War Fundy" (launched Aug., 1918) and "War Moncton," 250 ft. x 42 ft. 5 in. x 25 ft. 5 in., 1,000 h.p., speed 9½ knots, 2,800 tons d.w., for undisclosed interests.

MARINE CONSTRUCTION CO., CANADA, LTD., ST. JOHN, N.B.

ST. JOHN SHIPBUILDING CO., ST. JOHN, N.B. (Plant at Courtenay Bay.

ST. MARTIN'S SHIPBUILDING CO., ST. MARTIN'S, N.B.

PETER & A. A. McINTYRE, ST. JOHN, N.B.
One 900-ton schooner under construction.

NEWFOUNDLAND

ANGLO-NEWFOUNDLAND DEVELOPMENT CO., BOTWOOD, NFLD.
Two three-mast aux. schrs., wood, 450 tons, 150 H.P. for the builders' account.

NEWFOUNDLAND SHIPBUILDING CO., HARBOR GRACE, NFLD.
To build ships of 1,200 tons d.w. Steel ships later.

M. E. MARTIN, MORRIS ARM, NR. ST. JOHN'S, NFLD.

UNION SHIPBUILDING CO., ST. JOHN, NFLD.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL, N.S.

NOVA SCOTIA

B. L. TUCKER, BASS RIVER, N.S.

JAS. S. CREELMAN, BASS RIVER, N.S.

HANKINSON SHIPBUILDING CO., BELLIVEAU'S COVE, N.S.
One schooner, 360 tons, wood.

ELI PUBLICOVER, BLANDFORD, N.S.

BRIDGEWATER SHIPPING Co., BRIDGEWATER, N.S.

W. A. NAUGLER, BRIDGEWATER, N.S.

H. MAC ALONEY, CANNING, N.S.

S. M. FIELDS, CAPE D'OR, N.S.
One three-masted schooner, 350 tons.
Keel laid for another three-master.

CHESTER BASIN SHIPBUILDERS, LTD., CHESTER BASIN, N.S.
Two schooners, 100 tons, wood. Launched Aug., 1917, Dec., 1917.
One four-masted schooner, 60 tons. Launched Sept., 1918.
One two-masted schooner, 100 tons. Launched June, 1918.

MORTIMER PARSONS, CHEVERIE, N.S.
One wooden three-masted schooner, 170 ft. x 38 ft. x 14 ft., 575 gr. tons, 900 tons cap., for builder's account. Launched Sept., 1918.
Two wooden three-masted schooners for builder's account.
One tern schooner, "Donald Parsons," 140 ft. keel x 34 ft. 4 in. x 12 ft. 4 in., 500 gross tons, 825 tons d.w. for Mortimer Parsons. Launched May 11, 1918.
Another vessel, same size. Launched Nov., 1918, for builder's account.

BAY SHORE SHIPYARD, CHURCH POINT, N.S.
Building two wooden vesse's for R. C. Elkin, Ltd., St. John, N.B.

MOISE BELLIVEAU, CHURCH POINT, N.S.
One schooner, 450 tons, wood.

FIDELE BOUDREAU, CHURCH POINT, N.S.
One schooner, 350 tons, wood.

J. E. GASKILL, CHURCH POINT, N.S.
Other yards at Grosses Coques, Little Brook, Meteghan and Port Wade, N.S.
Five wooden schooners from 344 to 387 reg. tons. All sister ships.

COMEAU SHIPBUILDING CO., COMEAUVILLE, N.S.
One three-masted wooden schooner, for builder's account, 450 tons.

J. W. COMEAU, COMEAUVILLE, N.S.
One schooner, 329 tons, Jan., 1918.

J. N. RAFUSE & SONS, CONQUERALL BANKS, DIGBY CO., N.S.
(Other plants at Salmon River and Shelburne, N.S.)

E. F. WILLIAMS, DARMOUTH, N.S.

ROBAR BROTHERS, DAYSPRING, N.S.
Schooner for Capt. Ivan Creaser, Dayspring.

MAURICE E. LEARY, DAYSPRING, N.S.
One wooden schooner, 225 tons, 135 ft. o. a. Launched Aug., 1918, for La Have Outfitting Co., La Have, N.S.

J. NEWTON PUGSLEY & CHAS. ROBERTSON, DILIGENT RIVER, N.S.
One schooner, three-masted, 475 tons.

McLEAN & McKAY, ECONOMY, N.S.

S. J. SOLEY, ROX RIVER, N.S.
One schooner, three-masted, 121 ft. keel, 300 tons. Built of native wood. Launched Sept., 1918. For builder's account. For sale.

ALLAN & FRASER, FRASERVILLE, N.S.
One schooner, 350 tons, wood.

BERNARD W. MELANSON, GILBERT'S COVE, N.S.
One three-masted schooner, wood, 250 tons net. Completed November, 1918, for builder's account.

AMOS BLINN, GROSSES COQUES, N.S.
One schooner, 375 tons. Jan., 1918.
One schooner, 350 tons, wood.

BINN BROS., GROSSES COQUES, N.S.

F. K. WARREN & CO., GROSSES COQUES, N.S. (Offices in Union Bank Chambers, Halifax, N.S., also.)
350-ton tern schooner, under construction Jan., 1918.

HALIFAX SHIPBUILDING COMPANY, HALIFAX, N.S.
Building four steamers for Canadian Government. Two of 8,100 tons and two of 10,000 tons. One keel laid January. Also operating dry dock and repair works.

J. WILLARD SMITH, HILLSBURN, N.S. (Head Office, St. John, N.B.)
One tern schooner, wood, 140 ft. keel, 35 ft. beam, 450 tons net reg. tons.

J. W. RAYMOND, LITTLE BROOK, N.S.
Building 500-ton wooden schooners for local owners.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S.
One 800-ton vessel for undisclosed interests. Launch about Dec. 24.

CONRAD & REINHARDT, LUNENBURG, N.S.
"Excellent," 600-ton, launch in January next. Also 175-ton schooner.

J. WILLARD SMITH, HILLSBURN, N.S.
Wooden three-masted schooner. Launch in April, 1919.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
750-ton auxiliary schooner. Completed in January, 1919.

OSMOND O'BRIEN & CO., NOEL, N.S.
"J. Miller," 700 tons. Keel laid April 18. Launched Nov. 20. Completed Nov. 27.

BERNARD & MELANSON, GILBERT'S COVE, N.S.
550-ton vessel for owner's account. Completed Nov. 25.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL
"Mapleland," 1000-ton schooner, fitted with twin Fairbanks-Morse oil engines, 200 horsepower. Complete about Dec. 10. For builder's account.

L. S. CANNING, WARD'S BROOK, N.S.
"W. C. Smith," 700 tons. Completed Dec. 18.

McLEAN & McKAY, ECONOMY, N.S.
"Truro Queen," 750 tons, 15 h.p. engine for hoisting sails and anchor. Completed.

HENRY COVEY, INDIAN HARBOR, N.S.

CHARLES GRIFFIN, ISAACS HARBOR, N.S.
One schooner, 40 tons, wood.

LEWIS SHIPBUILDING CO., LEWISTON, N.S.
One schooner, 670 tons. Jan., 1918.

INNOCENT COMEAU, LITTLE BROOK, N.S.
One three-masted schoner, 140 ft. x 35 ft. 6 in. x 17 ft. 6 in., 650 gr. tons, for the Weymouth Shipping Co., Weymouth, N.S., Can. Delivered Jan. 18, 1918.

J. W. RAYMOND, LITTLE BROOK, N.S.
One wooden schooner, No. 4, 140 ft. x 36 ft. x 17 ft., 575 gr. tons, for Jones Bros., Weymouth, Digby Co., N.S.

H. A. FRANK, LIVERPOOL, N.S.
Two wooden schooners, 500 tons, for builder's account.

McKEAN SHIPBUILDING CO., LIVERPOOL, N.S.

W. F. McKEAN & CO., LIVERPOOL, N.S.
One schooner 400 tons, Jan., 1918.

D. C. MULHALL, LIVERPOOL, N.S.
Two wooden schooners, one 300 gross tons, other 400 gross tons, for undisclosed interests.

ROBIN, JONES & WHITMAN, LIVERPOOL, N.S.
One schooner, 340 tons, wood.

SOUTHERN SALVAGE CO., LIVERPOOL, N.S.

CONRAD & REINHARDT, LUNENBURG, N.S.

LUNENBURG MARINE RAILWAY, LUNENBURG, N.S.

FRED A. ROBAR, LUNENBURG, N.S.

J. B. YOUNG, LUNENBURG, N.S.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.

J. ERNEST & SON, MAHONE BAY, N.S.
One schooner, 520 tons. Jan., 1918.

O. A. HAM, MAHONE BAY, N.S.
One schooner, "Dozle," 128 tons. Launching May 30. One motor boat about 20 tons.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S. (Leased to Montague Mahaffy, Toronto.)
One three-masted schooner, 325 tons gr. reg., 500 tons cap., West Indies freight type. Launched July.
Keel laid for another three-masted schooner with cargo capacity of 425 tons.

JOHN McLEAN & SONS, MAHONE BAY, N.S.
One schooner, 95 tons, wood.

J. A. BALSOM CO., LTD., MARGARETSVILLE, N.S.
One schooner, 409 tons. Jan., 1918.

CLARE SHIPBUILDING CO., METEGHAN RIVER, N.S.
One wooden schooner for builder's account. 400 tons.

A. H. COMEAU & CO., METEGHAN, N.S.
One schooner, 400 tons, wood.

AGAPIT COMEAU, METEGHAN, N.S.

JOHN F. DEVEAU, METEGHAN, N.S.
A 300-ton schooner was launched recently for Ritcey & Co., Lunenburg, N.S., and named Charles A. Ritcey.
1 schooner, 425 tons. Jan., 1918.
1 schooner, 400 tons, wood.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
One wooden sailing schooner, 800 tons d.w. Keel laid April 15th, 1918, to be launched December 17th and completed December 31st. Built for sale.

J. E. GASKILL, CHURCH POINT, N.S.
One wooden schooner, 750 tons d.w. Keel laid March, 1918, to be launched December 15th. Built for J. E. Corkill.

THERIAULT SHIPBUILDING CO.
One wooden vessel, 500 tons d.w. Keel laid September 18th, to be launched in May, 1919. Built for owners account.

SIDNEY ST. C. JONES, WEYMOUTH, N.S.
One tern schooner, "Westway," 450 tons d.w. Keel laid April 18, to be launcheed December 30, 1918, and completed in January, 1919. Built for sale. 130 feet by 28 feet 8 inches beam by 10 feet 6 inches deep.

THE HANKINSON SHIPPING CO., BELLEVEAU'S COVE, N.S.
One vessel, 750 tons d.w. "Charles Doucet," fitted for auxiliary engine. Keel laid April 1, to be launched December 17. One vessel 750 tons d.w. Keel laid Aug., 1918, to be launched April, 1919, and completed. Built for owners account.

FAUQUIER & PORTER, HANTSPORT, N.S.
One vessel 1,800 tons d.w. to be fiitted with two 100 h.p. crude oil engines (Canadian Fairbanks-Morse). Launched December, 1918, and completed January, 1919. Built for sale. Propose to lay keels for two 500-ton, 3-mast schooners as soon as this schooner is launched.

N.S. SHIPBUILDING & TRANSPORTATION CO., LIVERPOOL, N.S.
"Protea," 400 tons d.w., three-masted schooner with provision for Morse semi-Diesel engines. Keel laid Nov. 18. To be completed May account and sold to Pearson & Walker, Cape Town, S.A.
"Gordon T. Tibbs," 400 tons d.w., three-masted schooner. Keel laid Aug. 30. To be launched Dec. 15 and completed Jan. 19. Built for buildeer's account and sold to G. Tibbs & Sons, St. John's, Nfld.
One beam trawler, 900 tons d.w., 400 i.h.p., with two 200 Fairbanks-Morse semi-Diesel engines. Keel laid Nov. 19. To be completed May next. Built for Rafuse Grey et al Le Havre. Repairing schooner Karmoe for N.Y. owners.

H. ELDERKIN & CO., PORT GREVILLE, N.S.
Two vessels, 825 and 500 tons respectively. Keel laid April and August. To be launched December and January. Built for builder's account.

J. E. GASKILL, METEGHAN, N.S.

THOMAS GERMAN, METEGHAN, N.S.
One schooner, 350 tons, wood.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S. (Leased James Cosman's shipyards.)
Building several wooden schooners for own account.

DR. F. H. MACDONALD, METEGHAN, N.S.

METEGHAN RAILWAY & SHIPBUILDING CO., METEGHAN, N.S.
One wooden three-masted schooner, 182 ft. x 35 ft., 450 gr. tons.
One schooner, 470 tons, wood.

CHAS. McNEIL, NEW GLASGOW, N.S.
One wooden 3-masted schooner, 103 ft. x 30 ft. x 10 ft. 9 in., 200 tons, for builder's account. Launched July, 1918.
One wooden 3-masted schooner, 142 ft. x 25 ft. 4 in. x 13 ft., 500 gr. tons, for builder's account. Launched Oct., 1918.

THE NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.
Building two 2,800 ton steamers for Dominion Government.

O'BRIEN BROS., NOEL, N.S.
One schooner, 325 tons, wood.

W. R. HUNTLEY & SON, PARRSBORO, N.S.
One wooden schooner, 175 ft. x 39 ft. x 17 ft., 900 gross tons, for

C. T. WHITE & SON, SUSSEX, N.S.

WAGSTAFF & HATFIELD, PARRSBORO, N.S.
One schooner, 400 tons. Jan., 1918.

S. SALTER, PARRSBORO, N.S.

DOWLING & STODDART, PORT CLYDE, N.S.

SWIME BROS., PORT CLYDE, N.S.
Several small motor trawlers, for builder's account.

G. M. COCHRANE, PORT GREVILLE, N.S.

ELLIOTT GRAHAM, PORT GREVILLE, N.S.
One schooner, 360 tons. Jan., 1918.

SMITH CANNING CO., PORT GREVILLE, N.S.
One schooner, 350 tons, wood.

WAGSTAFF & HATFIELD, PORT GREVILLE, N.S.
One schooner, 400 tons, wood.

WILLIAM CROWELL, PORT LATOUR, N.S.

J. W. RAYMOND, PORT MAITLAND, N.S.
One schooner, 375 tons. Jan., 1918.

PORT WADE SHIPBUILDING CO., PORT WADE, N.S. (Head Office, Digby.)
One 350-ton schooner, wood.

JOHN BROWN, PUBLIC LANDING, N.S.
One tow barge, 50 tons, wood.

THE CUMBERLAND SHIPBUILDING CO., PUGWASH, N.S.
Establishing plant for the construction of wooden ships.

MACKENZIE SHIPPING CO., RIVER JOHN, N.S.
One four-masted schooner, 600 tons, wood. About half built. Fitted for aux. engines.

CHARLES McLELLAN, RIVER JOHN, N.S.
One schooner, 100 tons, wood.

W. J. FOLEY, SALMON RIVER, N.S.
Building for J. N. Rafuse & Sons one wooden, 300 tons, under construction. Cap. of plant, 1,000 tons yearly.

J. N. RAFUSE & SONS, SALMON RIVER, N.S. (Other plants at Shelburne and Conquerall Banks.)
Launched recently a three-masted schooner named "Industrial," at W. J. Foley's ship yard at Salmon River, N.S., of the following dimensions: length, 113 ft, breadth, 30 ft., depth, 11½ ft., 325 tons.

ACADIAN SHIPPING CO., SAULNIERVILLE, N.S.
One schooner, 00 tons, wood.

SAULNIERVILLE SHIPBUILDING CO., LTD., SAULNIERVILLE, N.S.

J. LEWIS & SONS, SHEET HARBOR, N.S.
One schooner, wood, four-masted, 725 gr. tons. To be completed Sept., 1918. For private account.

GEO. A. COX, SHELBURNE, N.S.
One schooner, 200 tons, wood.
One schooner, 322 tons, wood.

JOSEPH McGILL SHIPBUILDING & TRANSPORTATION CO., SHELBURNE, N.S.
"Sparkling Glance," 246 tons register, for Harvey & Co., St. John's, Nfld.
One schooner, 160 tons, wood.

W. C. McKAY & SON, SHELBURNE, N.S.
One wooden schooner, 130 ft. o. a. x 26½ ft. x 11 ft. depth of hold, 140 tons register. Launched Dec. 1, 1917.
One three-masted schooner, for Messrs. Hallet, of Newfoundland.
One schooner, 620 tons, wood.

J. N. RAFUSE & SONS, SHELBURNE, N.S. (Other plants at Salmon River and Conquerall Banks.)

THE SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.

One tern schooner, "Misty Star," 145 ft. x 31 ft. x 11 ft. 6 in., 600 tons d.w., 330 tons gross, for Harvey & Co., St. John's, Newfoundland. Launching Mar. 15, 1918.

One tern schooner, 154 ft. x 32 ft. x 12 ft. 4 in., 400 gr. tons, 700 tons d.w. cap. Launching June, 1918. Not sold yet.

Two schooners, one 349 tons, other 400 tons.

EASTERN SHIPBUILDING CO., SHIP HARBOR, N.S.

One wooden schooner, 600 tons d.w., for J. N. Rafuse & Sons., Halifax, N.S., Can.

One wooden schooner, 300 tons.

STEPHEN MORASH & CO., SHIP HARBOR, N.S.

One wooden schooner, 150 ft. x 37 ft. x 13 ft., four masts, for Canadian interests. Keel laid Feb. 5, 1917.

JAMES E. PETTIS, SPENCER'S ISLAND, N.S.

One schooner, 425 tons, wood, three-masted.

CAPE BRETON SHIPBUILDING CO., SYDNEY, N.S.

THE TUSKET SHIPBUILDING CO., TUSKET, N.S.

AMOS H. STEVENS, TANCOOK, N.S.

ALVIN STEVENS, TANCOOK, N.S.

STANLEY MASON, TANCOOK, N.S.

ALBERT PARSONS, WALTON, N.S.

One schooner, 400 tons. Jan., 1918.

H. T. LeBLANC, WEDGEPORT. N.S.

One steam trawler, 165 ft., 600 tons, for J. N. Rafuse & Sons.

L. S. CANNING, WARDS BROOK, N.S.

One tern schooner, 350 tons, for W. C. Smith & Co., Lunenburg, N.S

WEDGEPORT NAVIGATION & TRANSPORTATION CO., WEDGEPORT, N.S.

T. K. BENTLEY, WEST ADVOCATE, N.S.

One 200-ton steamer.

One 4-masted schooner, wood, 511 tons. To be launched September or October. For owner's account.

J. W. KIRKPATRICK, WEST ADVOCATE, N.S.

One 350-ton schooner, wood.

BOEHNER BROS., WEST LA HAVE, N.S.

Two large fishing schooners, 150 tons each.

One beam trawler, 300 tons, crude oil engines. For local interests.

BEAZLEY BROS., WEYMOUTH, N.S. (Head Office Roy Bldg., Halifax.)

One schooner, 394 tons, three masts.

E. R. GAUDET, WEYMOUTH, N.S.

One 350-ton schooner, three-masted.

E. P. RICE, WEYMOUTH, N.S.

One three-masted schooner, 350 tons.

RICE, WARREN & CO., WEYMOUTH, N.S.

One three-masted schooner, 334 tons.

FALMOUTH SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

One wooden schooner, 350 gr. tons, 700 tons cap., for undisclosed interests.

NOEL SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

One wooden schooner, three masts, 138 ft. x 35 ft. x 13 ft., 450 net reg. tons. Oil auxiliary engines. Launching August, 1918, for builder's account.

C. A. NICKERSON, WOODS HARBOR, N.S.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.

Taken over and enlarging old plant of James Jenkins.

350-ton schooner building.

W. O. SWEENY, YARMOUTH, N.S.

100-ton fishing schooner.

YARMOUTH SHIPBUILDING CO., YARMOUTH, N.S.

One 450-ton wooden schooner, 128 ft. keel. To be completed Oct., 1918.

ONTARIO

CAN. ALLIS-CHALMERS (Head Office, Toronto), BRIDGEBURG, ONT.

Six standard freight steamers, 3,500 tons, 261 feet long, for undisclosed interests.

COLLINGWOOD SHIPBUILDING COMPANY, COLLINGWOOD, ONT.

"Canadian Warrior" completed. Three steel steamers on berths.

R. MORRILL, COLLINGWOOD, ONT.

"Windsor," Aug. 10, steam tug, 105 ft., for Ontario Gravel & Freighting Co.

CANADIAN CAR & FOUNDRY CO., FORT WILLIAM.

No present contracts.

GREAT LAKES DREDGING CO., FORT WILLIAM.

No present contracts.

THUNDER BAY CONTRACTING CO., FORT WILLIAM, ONT.

One wooden freight steamer, 261 ft. long, for undisclosed interests.

NATIONAL SHIPBUILDING COMPANY, GODERICH.

Building marine engines and boilers.

COLLINGWOOD SHIPBUILDING COMPANY, KINGSTON, ONT.

Building 3,500 ton steamer for Canadian Government.

DAVIS DRY DOCK CO., KINGSTON, ONT.

Building steel lifeboats.

GEORGIAN BAY SHIPBUILDING & WRECKING CO., MIDLAND.

Repairing several wooden tugs.

MIDLAND SHIPBUILDING CO., MIDLAND, ONT.

Two steel steamers for Imperial Munitions Board.

MIDLAND DRY DOCK CO., MIDLAND, ONT.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONT.

Building six ships for the Canadian Government and six trawlers

MUIR BROS.' DRYDOCK, PORT DALHOUSIE.

Repairing the wooden freight steamer "Windsor."

J. W. GEROW, ROSSPORT, ONT.

REID WRECKING CO., SARNIA, ONT.

DOMINION SHIPBUILDING CO., TORONTO, ONT.

Building six steel steamers, 3,500 tons, for undisclosed interests

POLSON IRON WORKS, TORONTO, ONT.

"War Timiskaming" launching in February. Three steel steamers on stocks. "War Hamilton" completed and ready for sea.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONTARIO

TORONTO SHIPBUILDING CO., LTD., TORONTO, ONT. (Toronto Dry Dock Co., Ltd., under same management.)

BRITISH-AMERICAN SHIPBUILDING COMPANY, WELLAND

"War Weasel" and "War Badger" completed. Third vessel on stocks

PRINCE EDWARD ISLAND

THE CARDIGAN SHIPBUILDING PLANT, CARDIGAN, P.E.I. (Pur-

QUEBEC

R. N. LE BLANC, BONAVENTURE, QUE.

J. Z. DEGAGNE, EBOULEMENTS, QUE.

THE DAVEY SHIPBUILDING COMPANY, LAUZON, QUEBEC

Building fifteen wooden vessels of 1,500 tons for French Government. Two 5,100 ton steamers for Canadian Government. One keel laid. Operating Champlain Dry Dock. Building extensive new machine shops. Building six trawlers for Department of Naval Service.

ATLAS CEMENT CONSTRUCTION CO., LTD., MONTREAL, QUE.

CANADIAN VICKERS, LIMITED

Building five 8,100 ton steamers for Canadian Government. One 4,450 ton steamer for Canadian Government. One 8,300 ton steamer for French Government.

FRASER BRACE & CO., MONTREAL, QUE.

Four wooden cargo steamers, 3,000 tons, for undisclosed interests. Two keels laid during Oct., 1917.

HALL ENGINEERING CO., MONTREAL, QUE.

MONTREAL DRY DOCK & SHIP REPAIRING CO., MONTREAL, QUE.

Operate dock 428 ft. long 30 ft. deep.

MONTREAL SHIPBUILDERS LTD., 37 Belmont St., MONTREAL, QUE. (Associated with Atlas Construction Co.

THE QUEBEC SHIPBUILDING & REPAIR CO., Board of Trade Bldg., MONTREAL, QUE.

2 vessels for undisclosed interests 3,000 tons each.

QUINLAN & ROBERTSON, MONTREAL, QUE. (Yards at Quebec.)

Four wooden steamers, for undisclosed interests.

LOUIS GAUNDRY, 12 St. Peter St., QUEBEC, QUE.

QUEBEC SHIPBUILDING & REPAIR CO., ST. LAURENT, QUE

2 schrs. 1,400 tons and 1,200 tons.

One wooden four-masted auxl. schooner "Martin Connolly," 223 ft. x 42 ft. x 20 ft., 2,100 tons d. w., for undisclosed interests. Launched Oct. 28, 1917.

QUINLAN & ROBERTSON, QUEBEC, QUE.

Four wooden steamers, totalling 6,400 tons, for undisclosed interests.

CANADIAN GOVERNMENT SHIPYARDS, SOREL, QUE.

One steel vessel for undisclosed interests.

H. H. SHEPHERD, SOREL, QUE.

Rebuilding seven drifters. Particulars withheld owing to govt. restrictions.

SINCENNES-McNAUGHTON LINES. SOREL, QUE.

One tug 410 tons, wood.

CAN. GOVERNMENT SHIPYARD, SOREL, QUE.

One steel vessel for undisclosed interests.

Building steam trawlers and wooden drifters for undisclosed interests.

LECLAIRE SHIPBUILDING CO., SOREL, QUE.

Six steel trawlers 125 feet long with single screw triple expansion engines, 500 i.h.p. Two of these launched in November. One more to be launched before ice comes in. Six wooden auxiliary schooners fitted with twin screw "Skandia" engines of 120 h.p. each. These will be all in frame at the end of November and four ready for launching as soon as ice is clear next spring.

NATIONAL SHIPBUILDING CORPORATION, THREE RIVERS, QUE.

"War Mingan" and "War Radnor," launched Oct. 15 and No. 2. Built for the Imperial Munitions Board and will be operated by Anning Bros., Cardiff, Wales. Now building 10 self-propelling barges for France.

Oxy-Acetylene Welding in the Railroad Shops

Interesting Facts Regarding the Use of the Oxy-Acetylene Welding and Cutting Torch in the Railroad Shop—Paper Read Before the Institution of Mechanical Engineers

By F. HAZLEDINE

OXYGEN.—Oxygen is obtained for commercial use by the commonly adopted methods of, first, splitting water into its elements—oxygen and hydrogen, by passing an electric current through it, and secondly, liquefying air, and splitting it into its elements—oxygen and nitrogen. The oxygen so obtained is stored in large gasometers, and then compressed into steel cylinders at a pressure of 120 atmospheres. It is then in a fairly pure state; the British Oxygen Co. guaranteeing their product to be from 98.5 per cent. to 99.5 per cent. pure.

As a result of storing the oxygen in contact with water in the gasometers, a certain quantity of moisture is carried by the gas into the steel cylinders; the moisture condenses, and to expel it from the cylinder, which it is advisable to do in order to prevent the valve freezing in cold weather, it is only necessary to invert the cylinder, and allow the pressure of the gas to blow the water out as the valve is opened and closed two or three times.

Acetylene.—Acetylene is a gas com posed of 92.3 per cent. carbon and 7.7 per cent. hydrogen. It contains the highest percentage of carbon of all the hydrocarbon series, and is produced by dissolving an equal volume of carbide of calcium and water. Carbide of calcium is made by fusing a mixture of lime and coke in the proportion of fifty-six parts by weight of lime to thirty-six parts by weight of coke in an electric furnace, the temperature of which is about 7,000 deg. F.

Several types of acetylene gas generators are in general use, and they may be classified as follows:

(1) Apparatus in which a quantity of gas sufficient for several days' use is manufactured and drawn off as required.

(2) Automatic generators in which the quantity of gas produced depends upon the quantity of gas consumed.

These are mostly of the moving-bell type, but they vary to the extent that in some the water is added to the carbide, and in others the carbide is added to the water.

The following is an analysis of "generator gas: Acetylene, 98.05 per cent.; oxygen, 0.08 per cent.; sulphuretted hydrogen, 1.7 per cent.; ammonia, 0.1 per cent.; phosphoretted hydrogen, 0.04 per cent.; silicon hydrate, 0.03 per cent.

Since the presence of sulphur and phosphorus in more than very small quantities is injurious to iron and steel, it is necessary to remove these impurities from the acetylene if reliable welds are to be made. This is done by a combination of mechanical filters and chemical actions, with a material which consists of iron-oxy-chlorides, the effect being the oxidation of the impurities. In cases where portability is of first importance, use is made of dissolved acetylene, which is supplied compressed to ten atmospheres in steel cylinders that are first filled with a porous material saturated with acetone—a liquid which readily dissolves acetylene. This gas, the use of which is known as the high-pressure system, is safe, clean, and pure; a point which has direct bearing on the quality of the weld produced.

The oxy-acetylene flame (the hottest flame known to science) consists of equal volumes of oxygen gas and acetylene gas, previously mixed in a chamber of the blow-pipe before issuing from the nozzle, where it combines with one and a half volumes of oxygen obtained from the atmosphere to complete combustion. The flame takes the formation of two cones—an inner cone of intense heat (about 6,300 deg. F. at the tip), composed of about equal parts of hydrogen, carbon, and oxygen, enveloped in a relatively cool flame of hydrogen and carbon-dioxide. However, much depends upon the regulation of the flame, as an excess of oxygen will cause the metal to be oxidized, and an excess of acetylene will cause the metal to be carbonized. The welder is guided by the appearance of the flame; that is, the relative size and shape of the two cones, and by the nature of the sparks thrown off from the metal, white star-shaped sparks indicating excess of oxygen. The blow-pipes in use are of two general types, namely:

(1) One for use with high-pressure gas (dissolved acetylene).

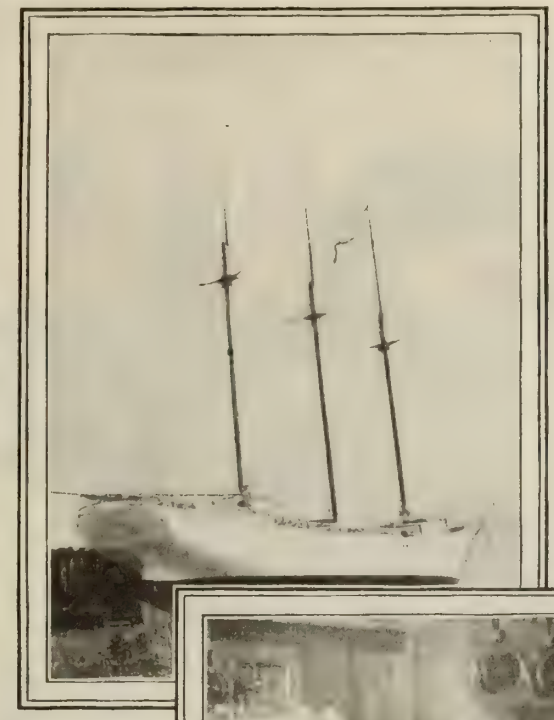
(2) One for use with low-pressure systems (that is, generator gas).

The latter type of blow-pipe is constructed on the "injector" principle, the velocity of the oxygen causing the acetylene gas to be drawn from the generator into the blow-pipe, where it is intimately mixed with the oxygen. It has been found necessary to insert, in all cases, a hydraulic safety-valve between the generator and the blow-pipe in order to eliminate any chance of the gas backfiring into the generator. The high-pressure blow-pipe is simpler in design. As the oxygen and acetylene are both under pressure, the "injector" construction is unnecessary, therefore the only arrangements required are: a suitable valve for the control of the oxygen gas, and a roll of wire-gauze to prevent backfiring of an explosive mixture. The best blow-pipes for general use are those which are supplied with different size tips ranging in capacity from 50 to 2,000 litres per hour. This obviates the necessity of having to purchase a number of complete blow-pipes, and is also the means of saving time when changing from one class of work to another, as it is easier to change a nipple than to disconnect and recouple the gas supply to a blow-pipe.

It is impossible to overestimate the importance of adequately preparing the work before the weld is actually attempted, as any time spent in this way is amply repaid afterwards, in the easier execution made possible by it, and also by the homogeneous nature of the weld. It is a matter, however, in which it is impossible to lay down any hard and fast rules; the varying nature of the work accomplished making it impossible to do so. The general principles obtained in the best practice point out that the line of the weld must be opened out, that is, the two sides bevelled to form an angle of 90 deg. The reasons for this are:

1. To make certain that the weld will be penetrated, not merely sealed over; and
2. To strengthen the weld by increasing the surface in contact.

It is essential that the line of the weld should be thoroughly cleaned either by hand tools or some chemical agent. The most important part of the preparation is that of arranging the pieces to be welded in such a position that there will be no deformation, breaks, cracks, or integral strains, and that they will be linable at the conclusion of the operation. This is the point in which the experience and skill of the operator is revealed as there are no rules to guide him; and upon any work but that of the very simplest character, failure to grasp and apply the laws of expansion and contraction means the partial or total ruin of the work. It is impossible to control expansion and contraction by physical force, so that the only way to prevent disastrous results is to foresee the probable direction and extent of the phenomena, and nullify the effect by preheating certain parts of the work, either by the blow-pipe, or by the welder's furnace. It is good practice when the article is not too cumbersome, to raise the temperature of the whole piece of work nearly to red heat in the furnace, make the weld whilst the temperature is still rising, and then allow it to cool slowly and uniformly in sand or asbestos, or by allowing the furnace to cool off, but in this case care should be taken to shield it from all currents of air. In large pieces of work, pans of charcoal and coke are placed in the immediate neighborhood of the place which it is desired to heat. In the case of castings it is advisable to preheat them bodily, not locally, as there is always the chance of discovering the presence of an internal strain due to the irregular cooling of the metal when it was cast. It is advantageous to preheat work in all cases in order to save oxygen and acetylene.



Auxiliary **Motor** Schooner "Samuel Courtney," 1918, equipped with 2-100 H.P. Fairbanks-Morse type "C.O." Semi-Diesel Crude Oil Engines.

Twin Screw, 7 Knots, 531 Gross Tons, 441 Net Tons, 171′ long, 35′ beam. Geo. M. Barr, Owner, Sam'l M. Courtney, Master. O'Brien Noel, N.S., Builder.



When Geo. M. Barr was deciding on the Power Equipment for the "Samuel Courtney" he chose what he considered the best money value on the market—

Fairbanks-Morse Type "C. O." Engines

They were selected because of proven economy, using low priced fuel oils. They give perfect regulation under light, heavy or intermediate loads. Made in sizes from 30 to 200 H.P.

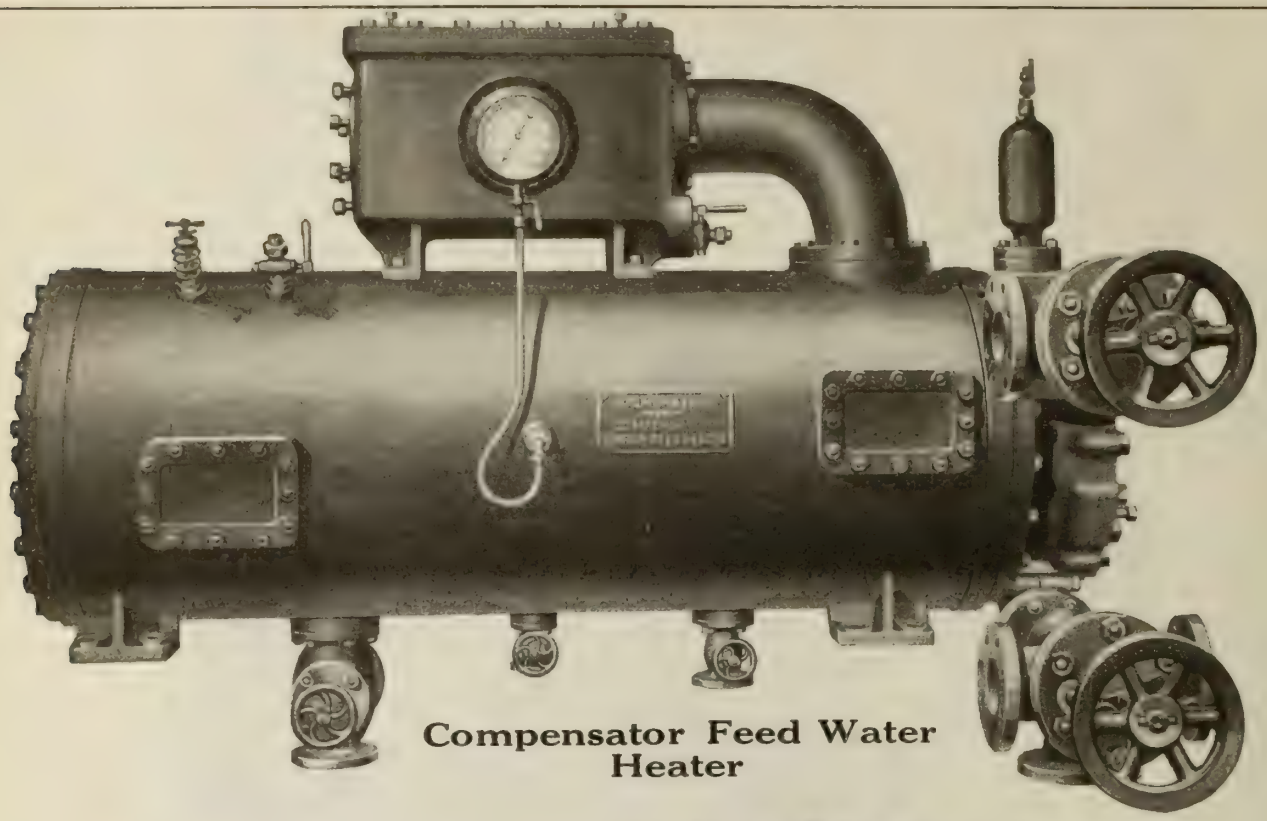
The Canadian Fairbanks-Morse Co.

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THE "CONTRAFLO SYSTEM"

of Condensing, Vacuum Producing, Filtering



Compensator Feed Water Heater



The "CONTRAFLO" Auxiliary Condenser

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WESTERN BRANCH: 248 McDermott Ave., WINNIPEG, MAN.

QUEBEC AGENTS: ROSS & GREIG, 400 St. James St., MONTREAL, QUE.

BRITISH COLUMBIA AGENTS: ROBT. HAMILTON & CO., VANCOUVER, B.C.

FOR STEAM SHIPS
and Feed Water Heating Apparatus

The "CONTRAFLO"
"CASCADE"

Feed Water Heater, Filter and Engine Drain Tank



The "Contraflo" System

Has the following advantages—

MAIN CONDENSER

Saves 20% of tube surface.
Saves weight.
Saves space.
Gives higher vacuum.
Produces more power in main engine.
Smaller quantity circulating water required.
Smaller circulating pump and engine.
Less heat carried overboard in circulating water.
Requires smaller air pump.

AUXILIARY (OR WINCH) CONDENSER

Saves over 50% of tube surface.
Saves 30% in weight.
Saves space.
Has a feed water temperature control.
Removes oil from exhaust steam.

COMPENSATOR FEED WATER HEATER AND OIL SEPARATOR

Requires less heating surface.
Saves space.
Saves weight.
Gives highest possible feed temperatures and uses only exhaust steam.
Removes oil from exhaust steam.

CASCADE FILTER TANK

Saves space.
Saves weight.
Removes oil from feed water.
Filtering apparatus simplest and most accessible made.
Heats boiler feed water and uses only exhaust steam from auxiliaries and drains from engine' receivers, etc.

"CONTRAFLO"

Saves money — Saves weight
Saves coal — Saves space

This system has been very largely adopted by the BRITISH MERCANTILE MARINE and that of other Nations.

Licensees for Canada

THE GOLDIE & McCULLOCH CO., LTD.

Head Office and Works : GALT, ONTARIO, CANADA

TORONTO OFFICE: Suite 1101-2, TRADERS BANK BLDG.
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BRITISH COLUMBIA AGENTS: ROBT. HAMILTON & CO., VANCOUVER, B.C.

SOME IMPORTANT POINTS ON BOILER HEATING SURFACE

(Continued from page 121)

Heating surface	Safety valve area	Max. evaporation	Weight of evaporation per sq. in. of S.V. per hr.
792 sq. ft.	10.42 sq. in.	7984 lb.	766.1 lb.
424 sq. ft.	5.58 sq. in.	6886 lb.	123.4 lb.

Evaporation in pounds per hour.

Total Coal burned per hour	From Fire Box. Total lb.	From Fire Box. per sq. ft. lb.	Total from Tubes		1st Section Total lb.	1st Section Per sq. ft. lb.	2nd Section Total lb.	2nd Section Per sq. ft. lb.	3rd Section Total lb.	3rd Section Per sq. ft. lb.	4th Section Total lb.	4th Section Per sq.ft. lb.
476.2	1806	23.5	1796	39.8%	964	5.4	445	2.5	240	1.33	147	0.83
743.0	2356	30.7	2754	53.9%	1368	7.6	735	4.1	387	2.15	264	1.48
923.7	2933	38.2	4064	58.0%	1969	11.0	1025	4.5	645	3.61	425	2.38
1025.0	3291	42.9	3699	52.9%	1778	9.8	920	5.1	579	3.24	422	2.36
978.8	2981	38.9	5003	62.6%	2499	14.0	1228	6.8	774	4.32	502	2.81
With half tubes stopped												
388.0	1811	26.5	1467	44.7%	803	9.0	356	4.0	191	2.09	117	1.31
610.7	2057	30.1	2183	51.5%	1138	12.8	550	6.2	308	3.37	187	2.09
707.7	2710	39.6	2909	51.7%	1448	16.2	722	8.1	449	4.90	290	3.24
793.6	2979	43.6	3273	52.3%	1624	18.1	845	9.5	475	5.18	334	3.75
848.8	3058	44.7	3828	55.6%	1874	21.0	948	10.6	580	6.34	425	4.76

	Area of Flue-way	Coal per sq. ft. of Grate	Water from and at 212° F. per pound of combustible
	sq. ft.	lb.	lb.
No Ferrules	0.99	16.57	8.33
Ferrules 3-16" thick	0.738	16.53	8.58
Ferrules 7-16" thick	0.460	16.61	8.56
Ferrules ¾" thick	0.204	5.79	11.07

Isherwood's Experiments on Varying the Tube Surface. Grate Area=10.8 sq. ft.

Heating Surface.		H S ÷ G A	Area of Flue-way	Coal per sq. ft. Grate	Water from and at 212° F. per pound of combus.
	sq. ft.		sq. ft.	lb.	lb.
Normal	150.30	14	0.99	16.5	8.33
	125.10	11.58	0.64	16.5	8.13
	99.91	9.25	0.495	16.5	8.75
	74.72	6.92	0.25	16.5	8.94
	125.10	11.58	0.64	13.75	8.41
	99.91	9.25	0.495	11.03	8.95
	74.72	6.92	0.25	7.48	11.00
All Tubes Stopped	45.5		0.721	16.57	6.325
	45.5		0.510	16.58	6.34
	45.5		0.248	11.77	7.79
Grate area = 8.64	149	17.24	0.99	15	9.11
" = 8.64	149	17.24	0.99	20.73	8.34
" = 6.48	148	22.84	0.99	15	9.16
" = 6.48	148	22.84	0.99	27.42	8.08
" = 4.32	147	34.03	0.99	15	9.68
" = 4.32	147	34.03	0.99	27.58	8.17

The author trusts that enough has been said to enable the value of heating surfaces generally to be discussed, and a clearer view of its practical limitations to be realized by boiler designers and users.

(To be continued)

It is believed that nearly 30 per cent. of Canada is still unexplored.

Many Mexicans came over the border recently to learn from a Government agent how to make cottage cheese.

Shipbuilding Material

Equipment and Tools

Steel, Iron and Brass Castings

Hammered and Drop Forgings

Water-tight Doors

Tanks, Stacks and Plate Work

J. H. F. DIXON

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CABLE ADDRESS: "PAJONES, MOBILE." ALL LEADING CODES USED.

WIRE WORK FOR BERTH ENDS AND SIDES

We specialize in Boat Railings and Non-Slip Iron Stairways.

Inquiries solicited

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SITUATION WANTED

MECHANICAL AND STEAM ENGINEER open for appointment as plant engineer in an industrial plant or shipyard. Sound, practical man with good initiative and executive ability, experienced in the maintenance and installation of medium and heavy machine tools, steam and air lines, transmission, etc. Age 37. Seventeen years' engineering experience, and held position as above in a large shipyard for seven years with marked success. Correspondence invited to Post Office Box 1965, Montreal (m4e)

SIX NEW DOUBLE CYLINDER, SINGLE DECK winches, 8" x 10", reversible link motion, compound gear, four winch heads. Lifting capacity seven tons on single line; shipping weight seven thousand three hundred pounds. Immediate shipment. Price fifteen hundred dollars each. Further information on application. The National Shipbuilding Co., Ltd., Goderich, Ont.

A PASSENGER AND FREIGHT STEAMER, about 200 ft. in length, 30 ft. to 36 ft. beam. 11 to 14 miles speed, carrying capacity from 300 to 600 tons, or a barge answering above requirements without the passenger accommodation. Apply giving full particulars and price to Collingwood Steamship Co., Ltd., Box 827, Collingwood, Ont.

FOR SALE—TWO 360 H.P. DUESENBERG marine engines, new, 8 cylinders, 6¾" x 7¾"—each $5.000. Also a 72-foot new motor boat, equipped with three of these engines, speed 35 miles an hour, cost $52,000—our price, $35,000. Box 151, Marine Engineering. mtfe

NEW Cleveland POCKET-IN-HEAD Riveter

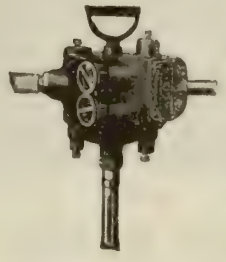
Cleveland Riveting Hammers
For Ship Yards and Boiler Shops



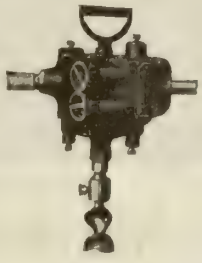
Cleveland Pocket-in-Head Riveting HAMMERS are shorter, weigh less, hit harder, run faster, use less air and have less recoil than any Riveter on the Market. The "Pocket"-in-Head is a "Reservoir" surrounding Main Valve and is filled with Compressed Air, which is discharged in Volume on Piston at each Stroke, greatly increasing speed and power of Blow. Ideal for "Piece-Workers" in Ship Building. Made in 5 sizes: Nos. 40, 50, 60, 80 and 90, with Outside and Inside Latch. Driving capacities from ⅜-in. to 1½-in. Rivets.



Cleveland Metal and Wood Boring Machines
For Ship Building and Boiler Construction



The No. 20-W, illustrated, is speedy and easily handled by one man. Made in 3 sizes—Nos. 10-W, 20-W, 30-W. Capacities, 1" to 4". The No. 20-TC, illustrated, is a lightweight compound geared machine; speeds 150 or 250 R.P.M. Capacity, 1¼ drilling in steel, ⅞" reaming. An ideal one-man machine.

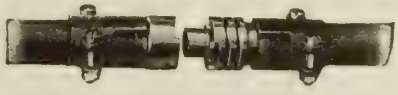


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BOWES AIR HOSE COUPLINGS
Over 1,500,000 in general use

AIR  TIGHT

Cleco clamps attached to Bowes Couplings

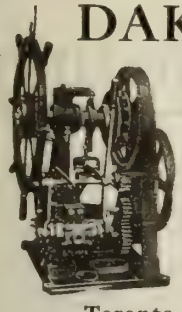
CLECO AIR SEATED VALVES
Always Tight
No Packing
Connect with
Bowes Coupling.



Write for Bulletins, 34, 38, 39

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A. R. Williams Machinery Co., Toronto AGENTS Williams & Wilson, Montreal

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Anchor Windlasses	Drill Hoists
Capstans	Spud Hoists
Mooring Hoists	Net Lifters

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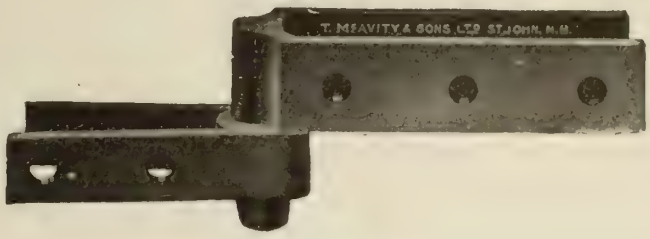
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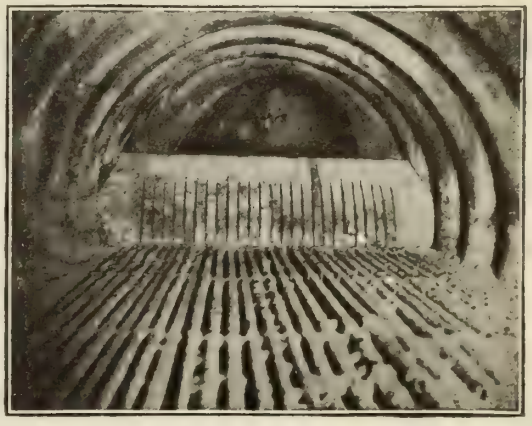
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Other Outstanding Features of April MacLean's

"Imperial Relations Must be Worked Out," by Viscount Bryce. An important announcement on the future construction of the British Empire.

"Reconstruction in Turkey," by Stephen Leacock. A humorous article on the present condition of things in Turkey as seen by Canada's great humorist, and applied to Canadian conditions.

"Bulldog Carney," by W. A. Fraser. A splendid novelette of the Canadian West, complete in this issue. Illustrated by Charles L. Wrenn.

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"Canada's Fishmonger General," by Thomas M. Fraser. An article on a young Canadian who put Canadian fish on the diet of the British armies by a series of Barnum and Bailey advertising stunts.

"Bombing the Boche," by Lieut. J. Vernon Mackenzie. The second of the two articles that Mr. Mackenzie has written on the whirlwind campaign of raid reprisals which so frightened all Germany.

"The Transformation," by Frederic S. Isham. Illustrated by Hanson Booth. The second instalment of this sparkling new serial.

"Man and Wife," by C. W. Stephens. Illustrated by R. M. Brinkerhoff. The first instalment of a three part story of Canadian life by a new Canadian writer—a delightful love story with a background of business intrigue.

The Review of Reviews

The best articles from all publications the world over are selected and condensed for this department. Some of the articles in the April number are:

The Man Behind Bolshevism.
Could German Fleet have been Destroyed.
The Secret Plans of the Allied Command.
Too Much Wilson.
Is the ex-Kaiser Haunted?
Next Government Will be Labor.
New Life of Deposed Princess.
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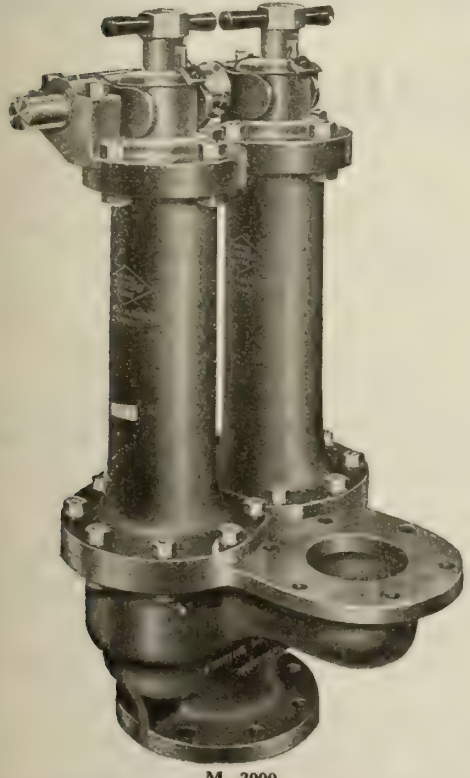
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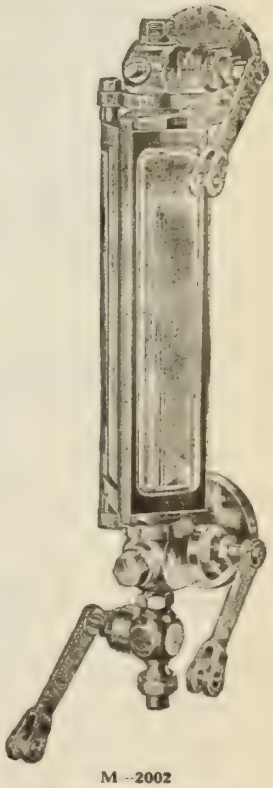
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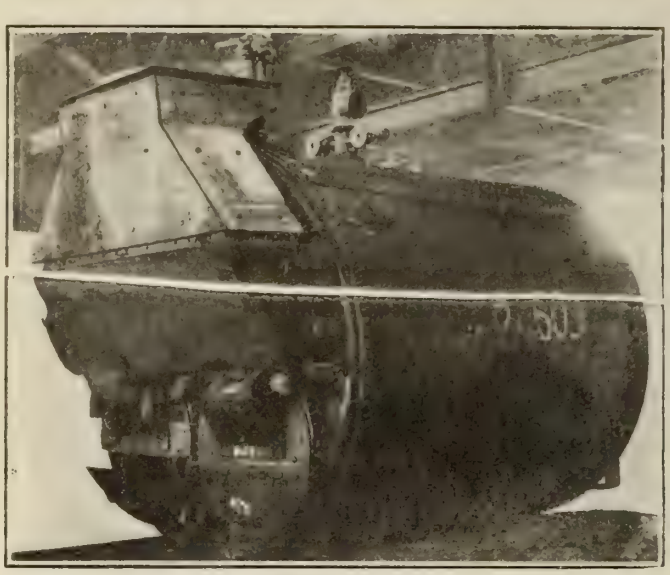
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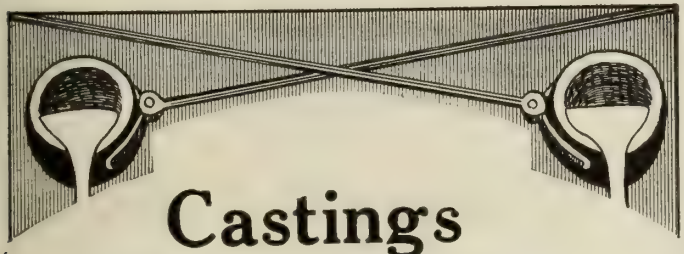
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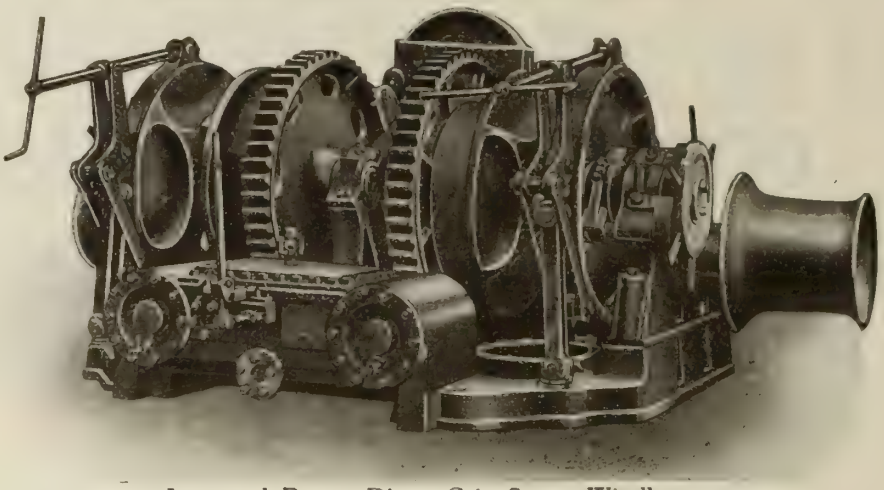
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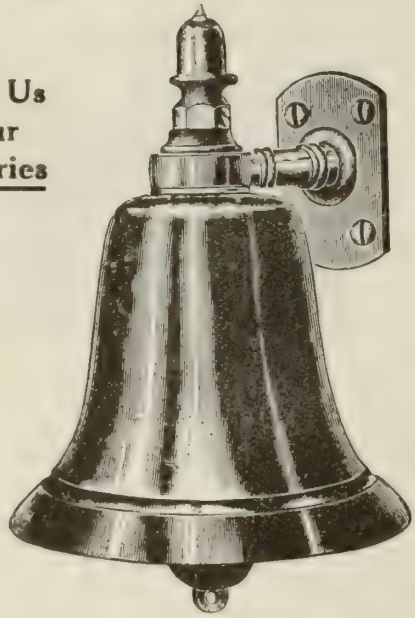
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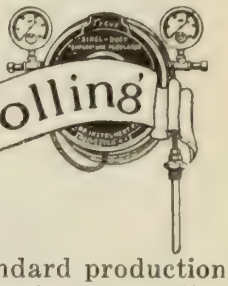
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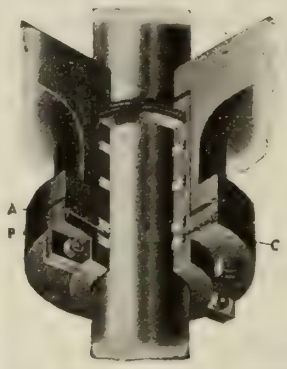
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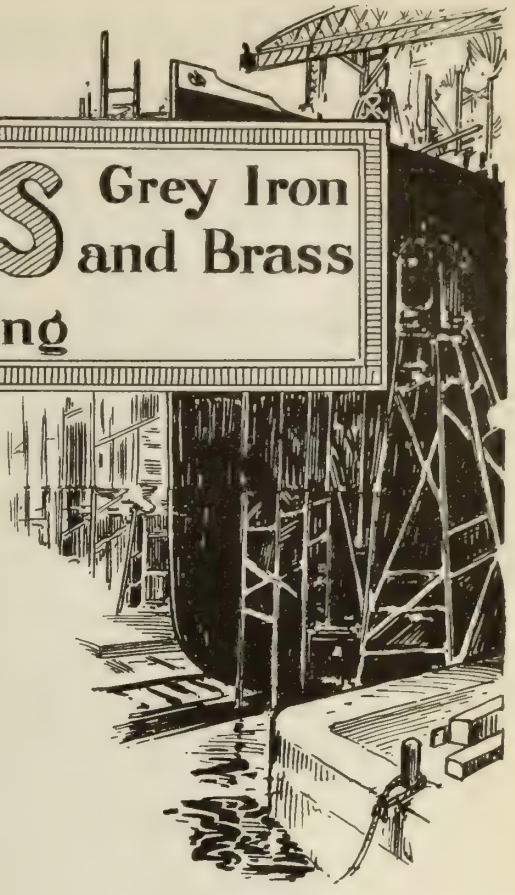
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The above is a portion of an important leading article in THE POST *of March 15th—an issue of exceptional interest. In addition to this*

THE FINANCIAL POST

OF MARCH 15th CONTAINS:

F. P. JONES SPEAKS OF EMBARGO REMOVAL

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Note These Contents of THE POST Dated March 22nd

Tariff Revision Must Be Made On Scientific Basis

Manufacturing Situation Misunderstood

No Six Hour Day for Brains

Unemployment and Bolshevism

Housing Bills Make Progress in Two Provinces

One Year's Result of Government Railroad Control

Royal Bank Now Owns Merchants National N. Y.

Hamilton Bank Aided Business and Government

Uncertainties of Tariff Hold Market Back

South Alberta for Big Irrigation Scheme

C. P. R. Earnings Fell to 10.79 Per Cent on Common

C. P. R. Earnings and Government Tax

Slow Decline in Prices Boom to Retailers

Big Decline in Munitions End of Canada Cement

Scotia Earned 11 Per Cent. in Common in 1918

United Farmers of Ontario in Retail Field

Steel Prices Sliced $7.00 a Ton

Budget Speech of B. C. Minister Comprehensive

Business Building News Items Appear Each Week in *The Financial Post*

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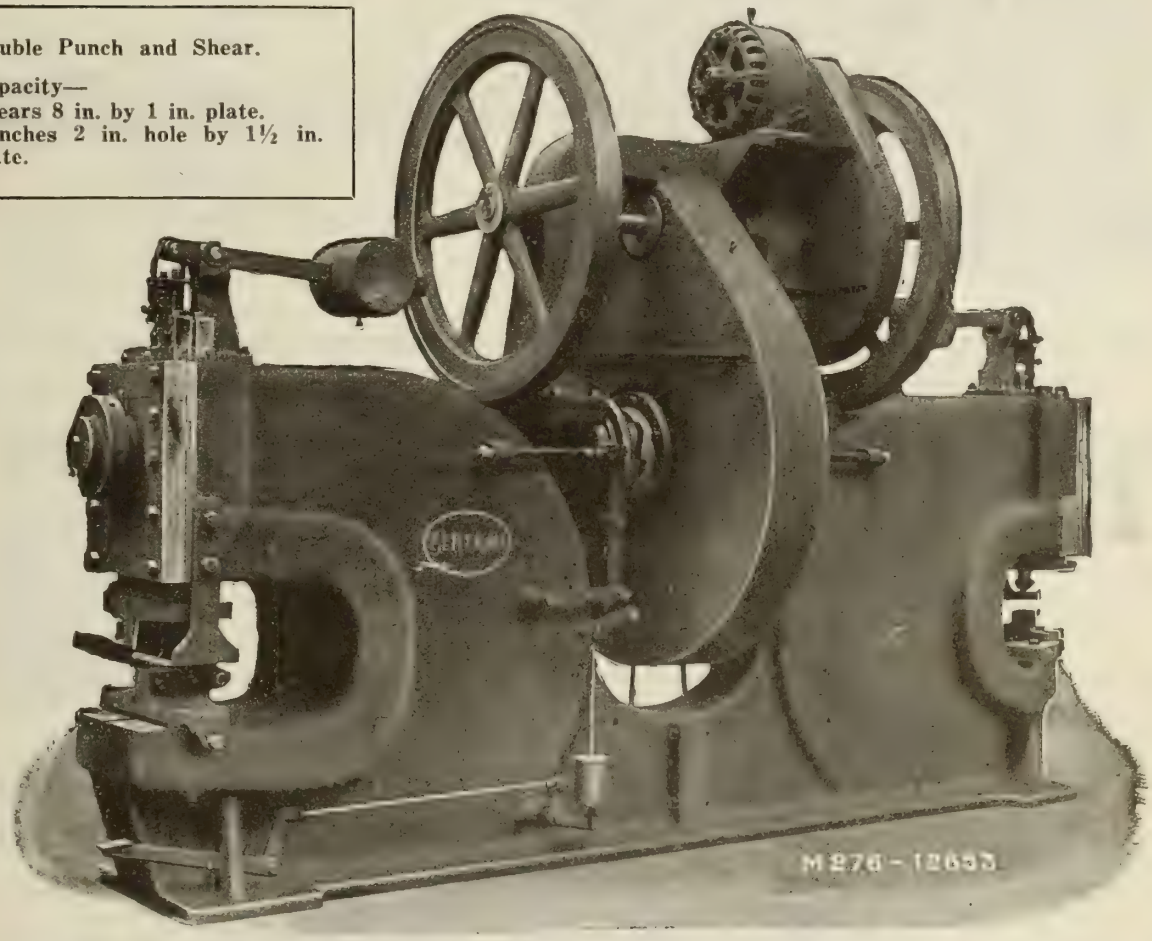
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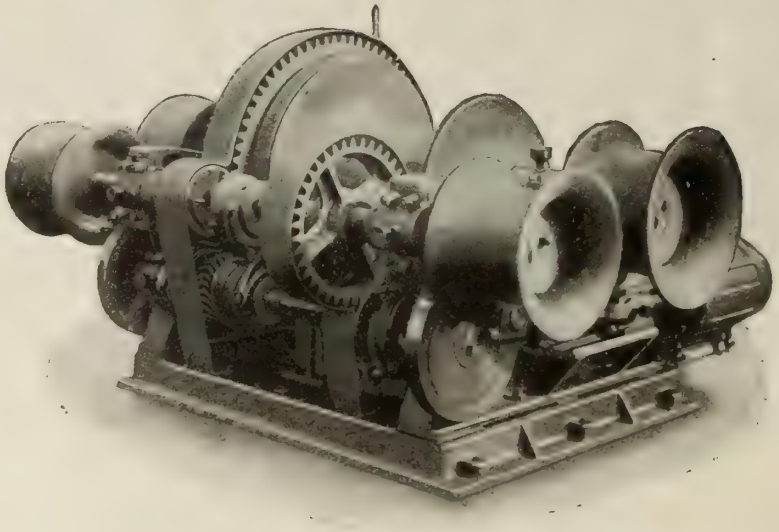
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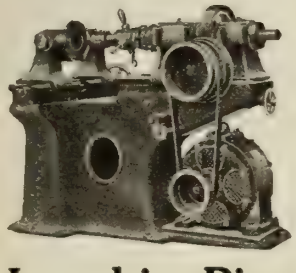
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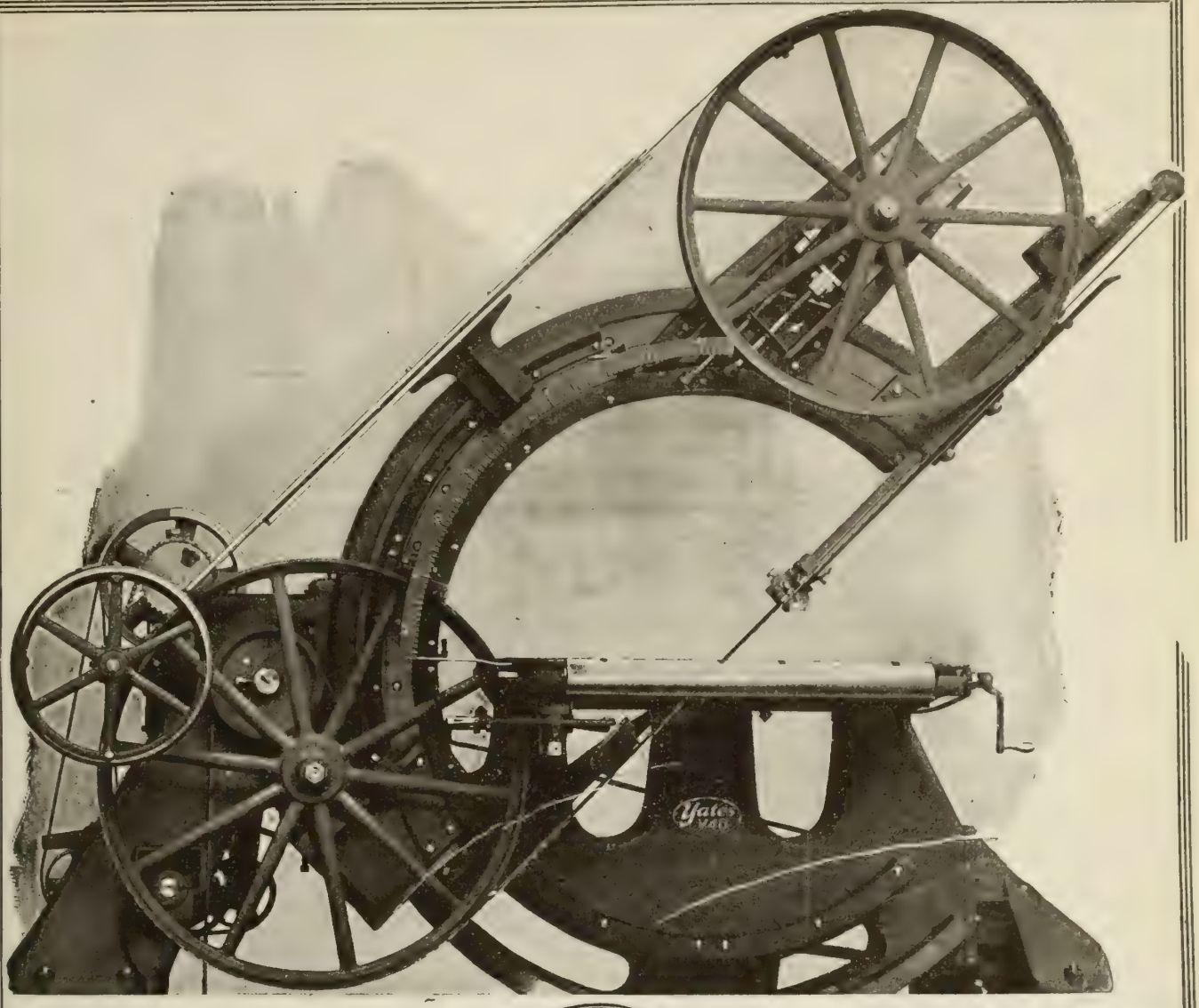
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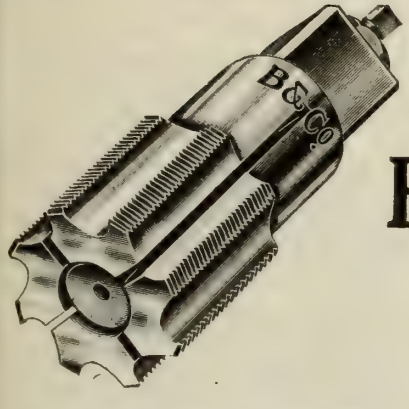
WRITE FOR BOOK 66

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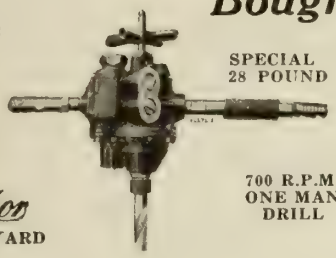
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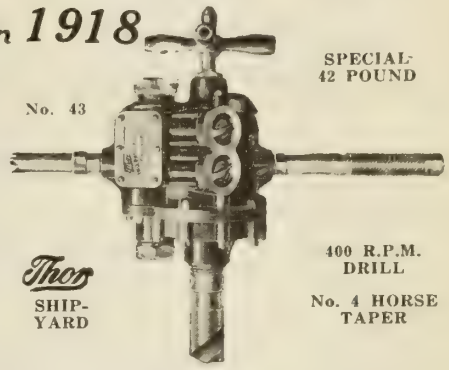
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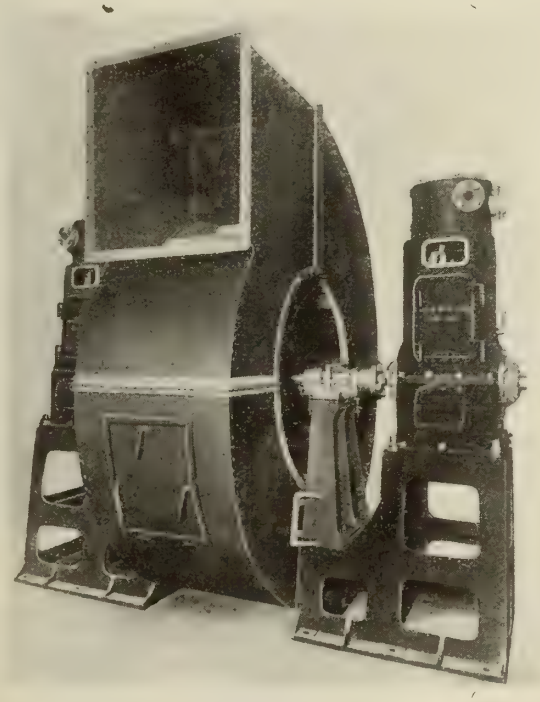
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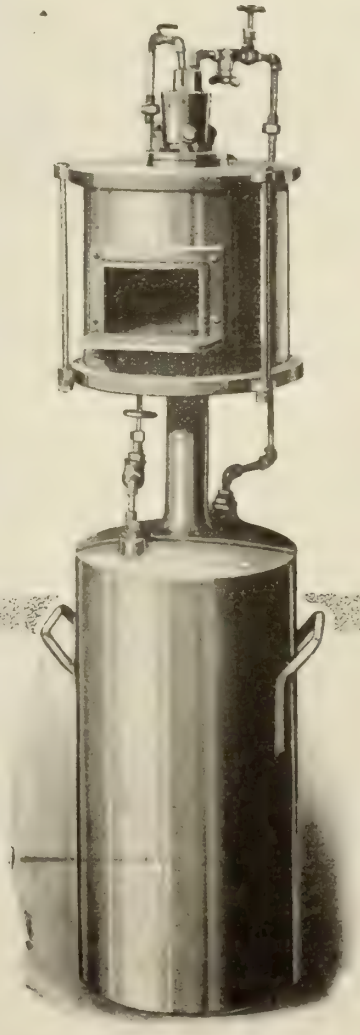
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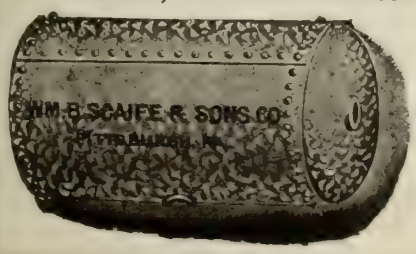
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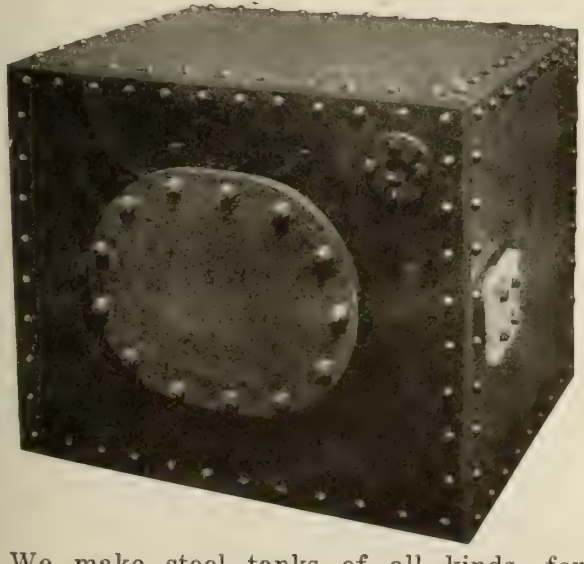
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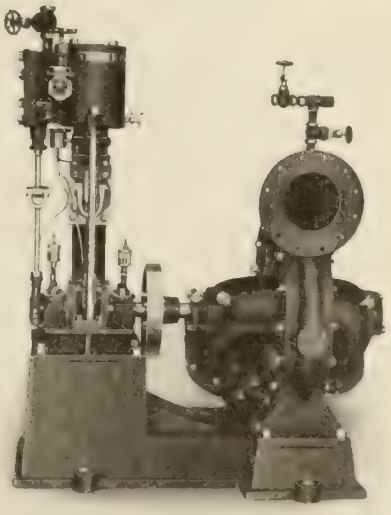


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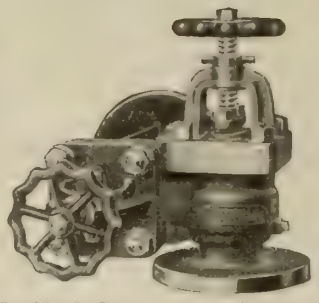
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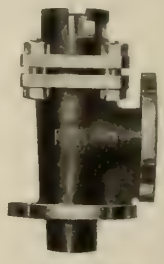
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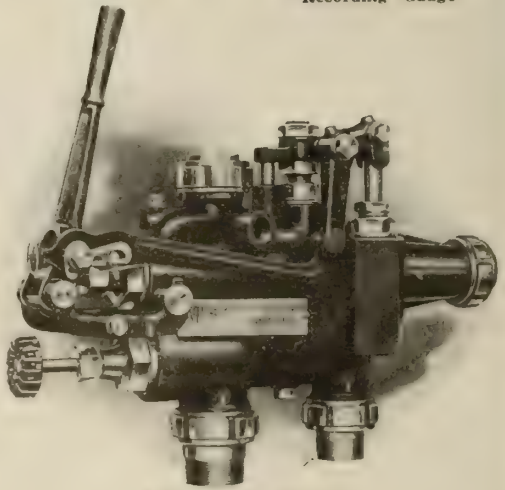
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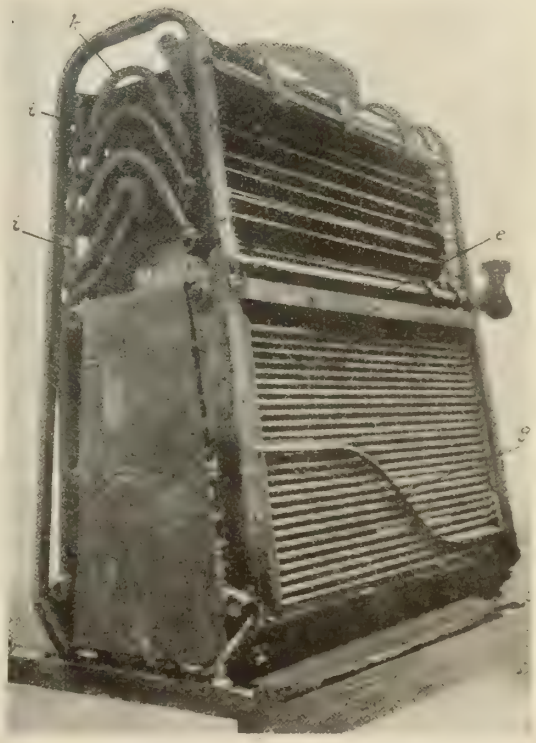
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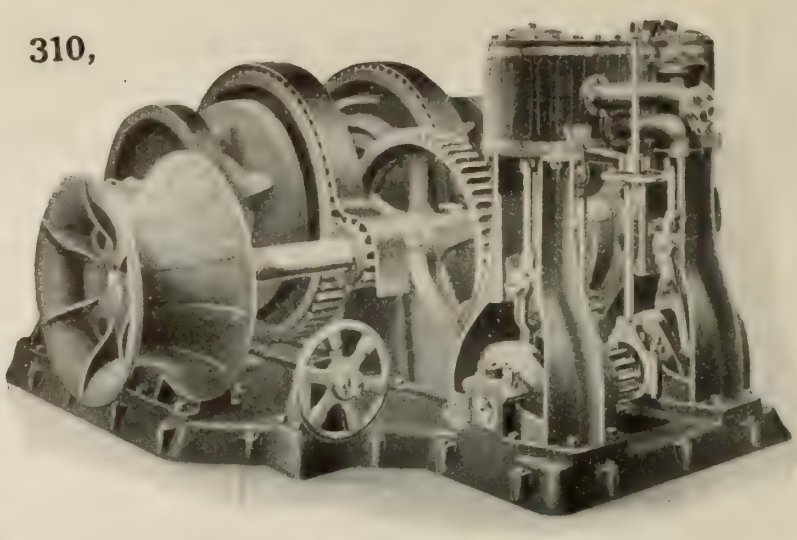
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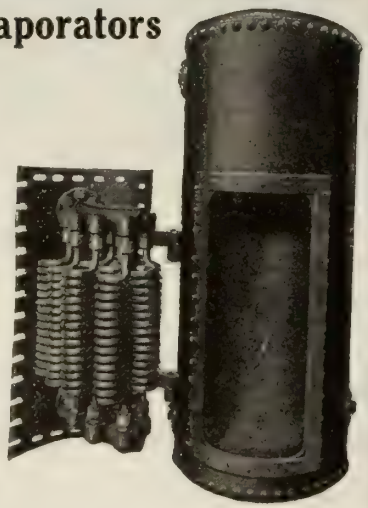


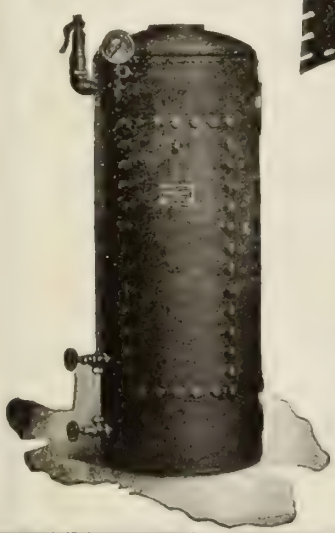
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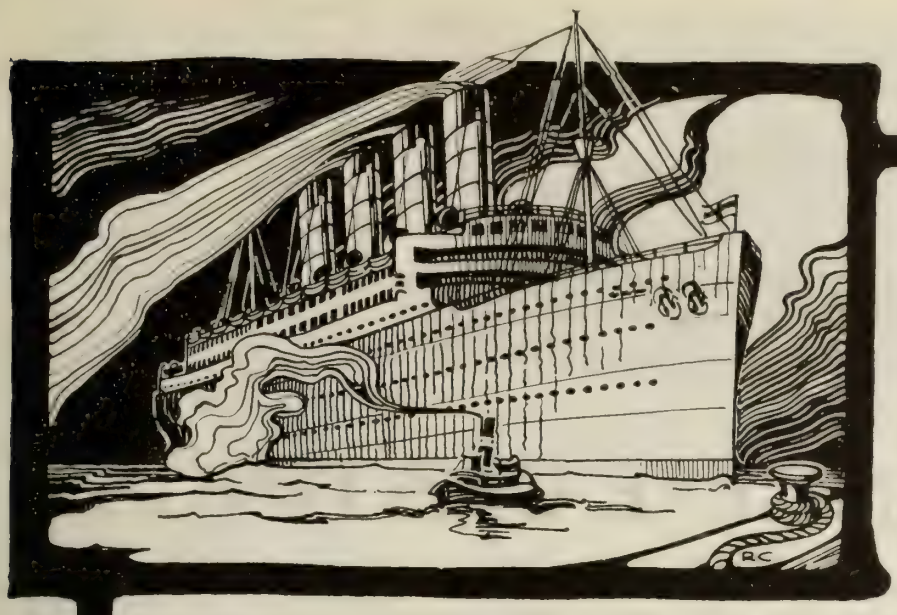
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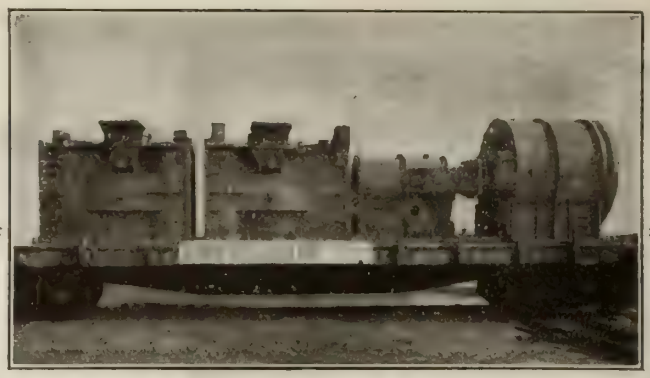
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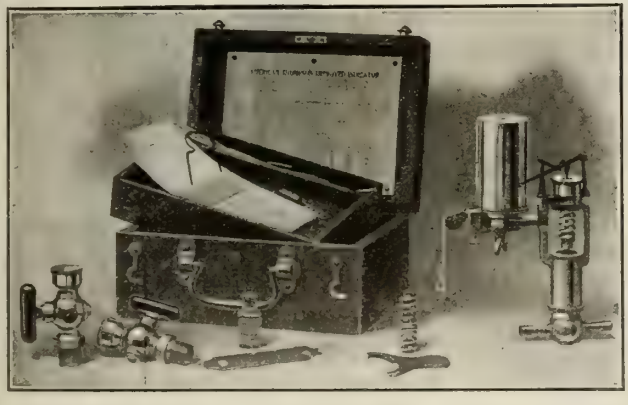
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The Publisher's Page

TORONTO APRIL, 1919

The Canadian Merchant Service Guild Joins Hands With This Journal

THERE is in Canada a young but extremely vigorous organization known as the Canadian Merchant Service Guild. The aims and object of this association are clearly set forth on another page of this issue.

The "C.M.S.G." have adopted MARINE ENGINEERING OF CANADA as the best medium for an exchange of association news and views. The Canadian Merchant Service Guild, an important body now and destined to become more influential as time goes on, claims as members the captains and officers in our Canadian Merchant Service, and, in order to give the association the co-operation and recognition it deserves, we have changed the name of our publication to

Marine Engineering
and
Canadian Merchant Service Guild Review

In this and subsequent issues will be found a department devoted to the activities of the Guild, special articles of interest to navigators, and marine news of all kinds. The regular features of our paper will be continued and strengthened and the additional department will but lend interest to an already interesting editorial bill of fare.

Let it be distinctly understood that it has long been the policy of the MacLean Publishing Company not to represent any association—organization or union through any of its fifteen publications, and we do not now claim to represent the Canadian Merchant Service Guild as an official organ. The management of the Guild simply selected our journal as a medium through which could be published information of a news and educational character. We are proud of the distinction which has been bestowed upon us and cordially welcome the members of the Canadian Merchant Service Guild. We know that our old subscribers will extend a welcome equally warm. Let us all pull together for a merchant service that will be a credit to Canada—Engineers, Masters, Firemen, Chief Officers, Ship Builders, Ship Owners and Government Officials. Let each be as efficient as possible. Let there be good-will and tolerance, progressiveness, a steady ambition and high ideal and a worthy objective.

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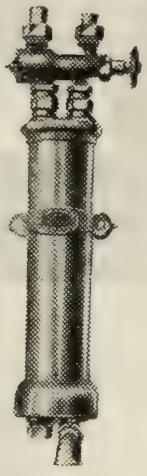
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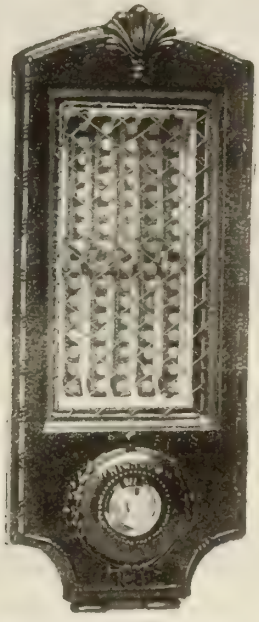
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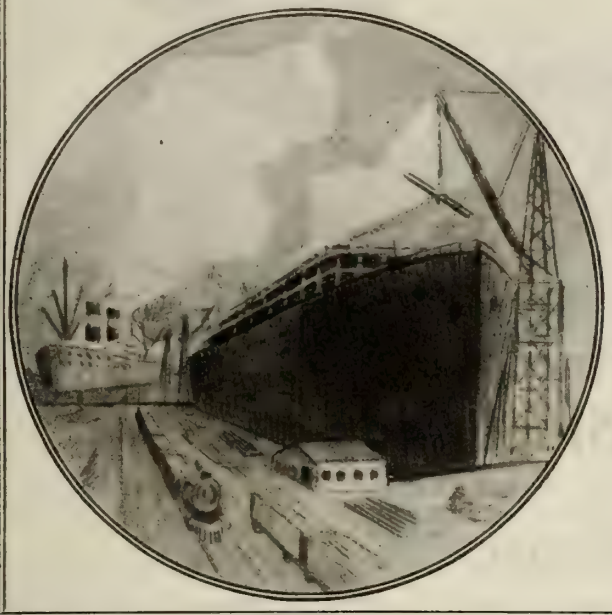
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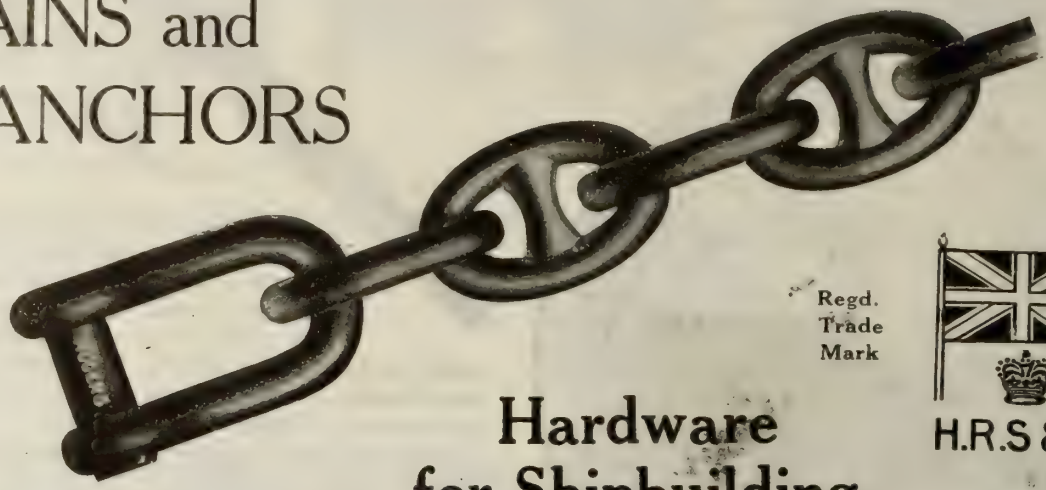
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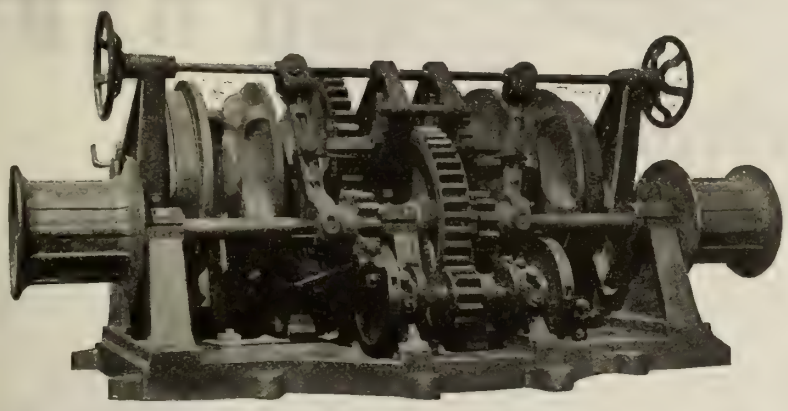
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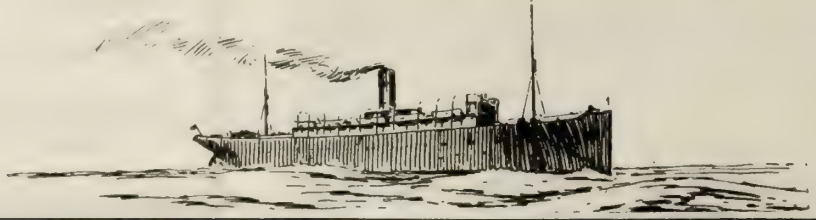
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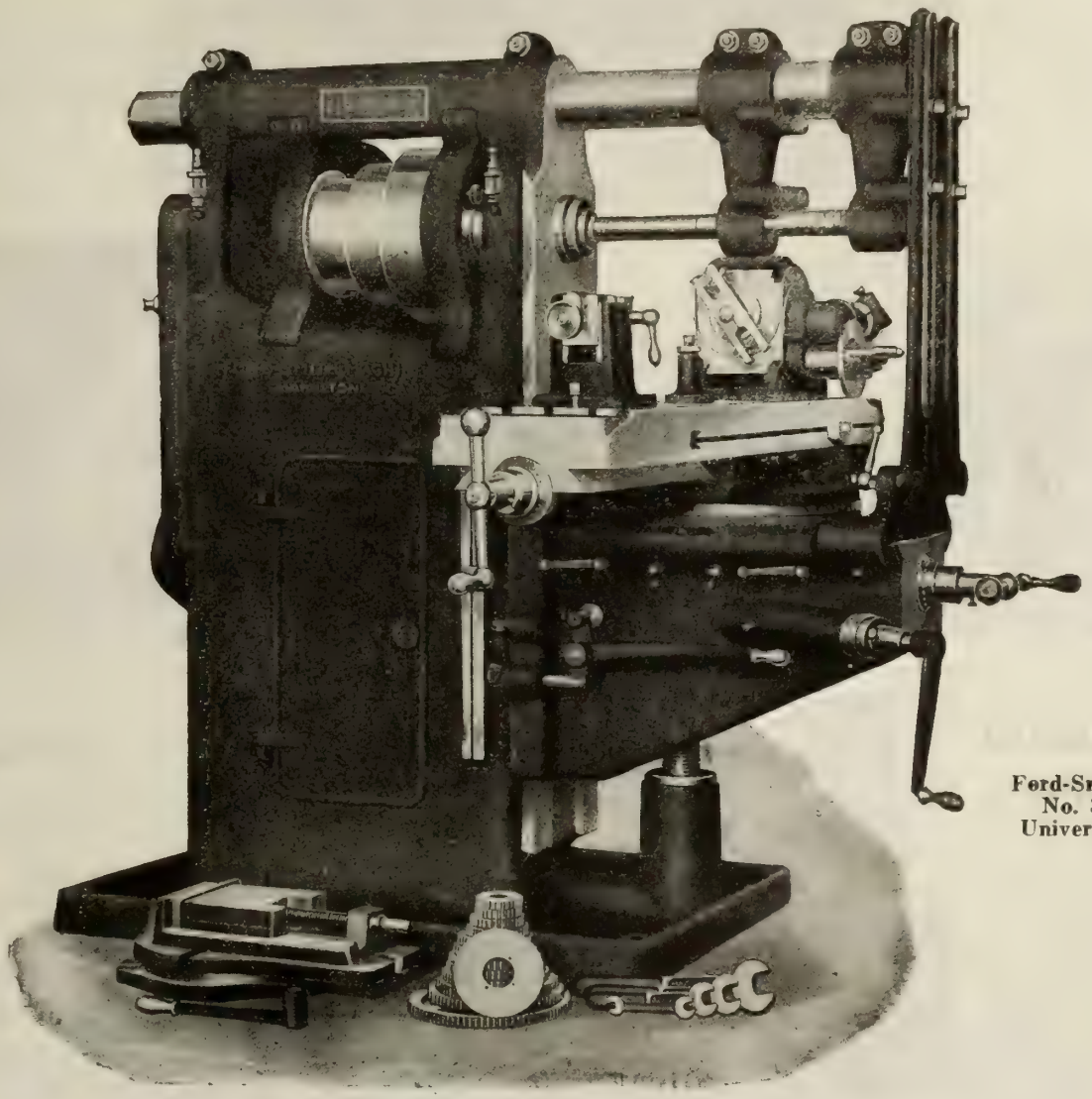
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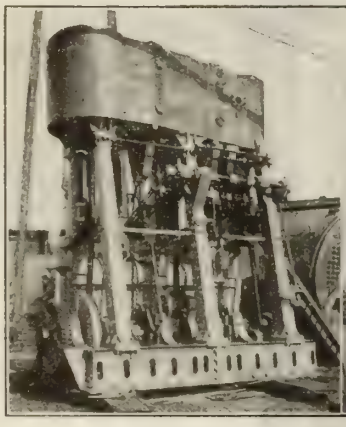
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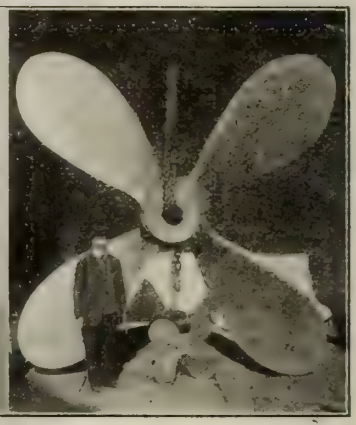
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Description of the Seaplane-Carrying Ship Argus

A New Type of Naval Vessel, Embodying Some Unique Features —Funnels are Laid Over Stern Horizontally—Was Originally Built as a Passenger Liner

By Courtesy of "Engineering"

ONE of the most interesting ships added to the navy during the war was the seaplane-carrying ship "Argus," built by Messrs. Wm. Beardmore and Co., Limited, at their works at Dalmuir on the Clyde. It is true that the Admiralty adapted the battle cruiser "Furious" to accommodate seaplanes and to permit them to rise from the deck, and this vessel, with her 90,000 h.p. geared turbine machinery, had a speed of 32 knots, which gave her a great advantage over the Argus in point of speed. Further, there is now being built specially for the same duty, the cruiser Eagle, also of high speed, and specially adapted to enable seaplanes to rise from her deck. The Argus, however, has the advantages that there is absolutely no obstruction on the flying deck, not even funnels, and that she has, under this deck, space for the accommodation and repair of seaplanes. She is therefore a floating hangar, the space given up for this purpose being 330 ft. long, 68 ft. wide over all, and 48 ft. clear, with a clear height of about 20 ft. Hoists are provided from this hangar to the flying deck and cranes are available for lifting the seaplanes from the water on to the hangar deck. The structural arrangements in the ship to meet these abnormal conditions involved problems of design and construction which were admirably worked out and proved thoroughly successful. Perhaps, however, the most novel feature is the arrangement of the uptakes from the funnels so that the boiler furnace gases could be discharged over the stern. Here also gratifying success has been achieved, and the results reflect credit not only on the technical officers of the Admiralty but on those responsible for the building of the ship and her machinery at Messrs. Beardmore's works.

The vessel illustrated was laid down originally as a first-class passenger and cargo steamer for the Lloyd Sabaudo Company of Genoa, but work on her was discontinued at the outbreak of war. In 1916, however, the Admiralty decided to have her completed as a seaplane carrier, although the construction of the hull was in an advanced state, and it was not possible therefore so to alter it as to ensure a high speed. Modifications, however, were made to increase the power and raise the speed from 18 knots under normal sea conditions to 20¾ knots for short periods and 20 knots on service in ordinary weather. As originally designed and built the vessel was 535 ft. long between perpendiculars, of a molded breadth of 68 ft., with a height of 40 ft. to the shelter deck. The original form, structure and decks were retained up to the shelter deck, which it was decided should constitute the floor of the hangar. Thus all above the shelter deck was modified to provide hangar, workshops, stores and a flying deck.

In the early stages of the design of the superstructural work the method of supporting the flying deck was carefully considered. A ¼ in. scale model of the ship according to the proposed method of construction was sent to the National Physical Laboratory at Teddington to be tested in the air tunnel there. Exhaustive experiments on this model were carried out for the purpose of discovering the eddy-making effect of the structural work below and above the flying deck, and also about the after end, through which air eddies the aircraft had to pass when alighting on the deck. The result of these experiments showed that to ensure the minimum of air disturbance it was necessary that the space between the hangar roof and flying deck should be as open as possible. On account of this it was decided to make the hangar roof strong enough to withstand the greatest hogging and sagging stresses likely to come on the structure and to support the flying deck by very light lattice work. In addition, expansion joints were introduced at various points to insure that no stresses were to be taken up by the flying deck. Further it was discovered that the emission of hot gases through vertical funnels above the flying deck produced such serious air disturbance that the safe landing on the deck would be extremely difficult. This necessitated the fitting of the horizontal smoke ducts below the flying deck which

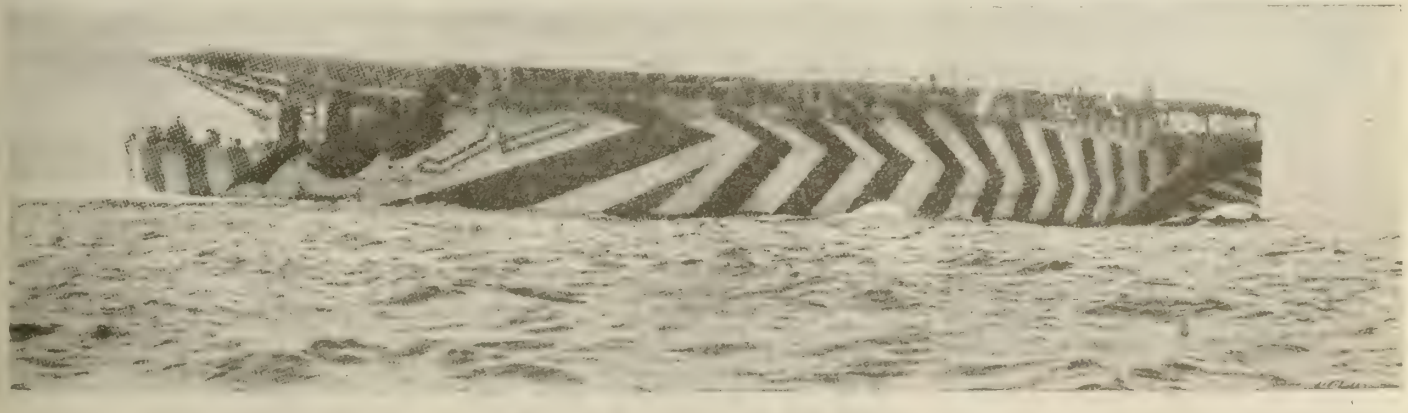


FIG. 2.—THE "ARGUS" ON HER TRIALS.

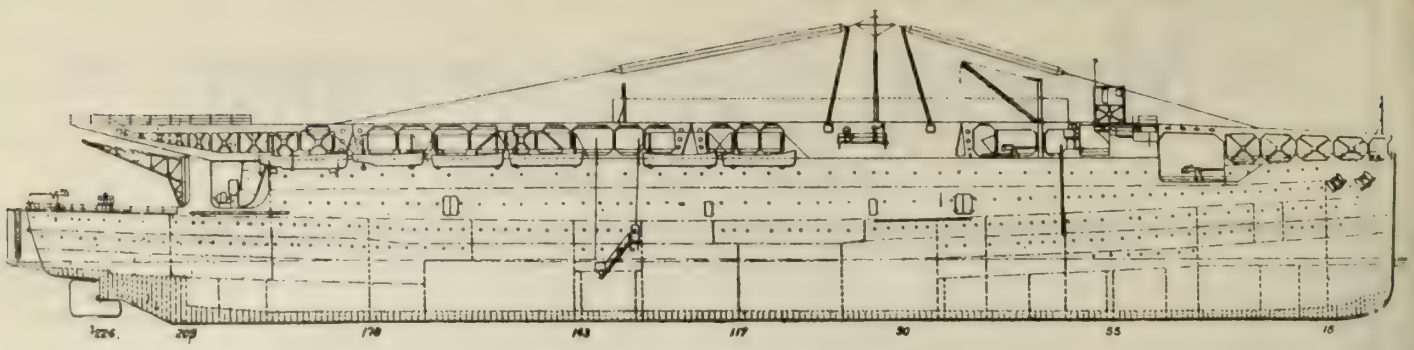


FIG. 1—LONGITUDINAL SECTION.

carry the gases right aft away from the stern. A striking feature of the design, as shown in Figs. 1 and 2, is the great overhang aft about 85 ft. abaft where the side plating ends, and the special arrangements for effectively supporting and anchoring this to the general structure.

The longitudinal section (Fig. 1) shows the arrangement of the hangar, the flying deck without obstruction, the wireless masts being at the side, as more clearly indicated in Fig. 2, which shows the vessels on her steam trials, while Fig. 3 is from a photograph taken at the time when a smoke "cloud" was being produced abaft the ship.

The hangar, designed to fulfil the latest requirements of the Air Board for this type of ship, is 330 ft. long by 68 ft. wide over all, and 48 ft. clear width, and is of a capacity regarded as sufficient to accommodate 20 seaplanes. To support the side plating of this hangar, deep web frames were carried up along the ship side to a height of about 25 ft. 6 in. above the original shelter deck. The roof was strongly constructed of steel on widely spaced transverse girders and longitudinal beams, as clearly shown. The girders are at such a height as to give about 20 ft. clear headroom in the hangar. The hangar itself is divided into four spaces by transverse fireproof curtains, fitted for the full height of the hangar. Immediately forward of the hangar are large workshops for engineers and carpenters, fully equipped with machine tools for the rapid repair of damaged parts of aircraft. Easy access to these workshops is obtained through large fireproof doors in the far end of the hangar.

The flying deck is 68 ft. wide, is fitted all fore and aft at a distance of 14 ft. 6 in. above the hangar roof, and is clear of all obstructions. The navigating bridge, bridge houses, wireless offices, etc., is placed forward under the flying deck. The chart house is capable of being raised above the flying deck level or lowered to a stowing position under the flying deck by hydraulic power, and when in raised position commands a clear all-round view.

There are two electrically-controlled lifts for raising the aeroplanes from the hangar to the flying deck. The after lift is 60 ft. long by 18 ft. wide, and the forward lift 30 ft. long by 36 ft. wide, and each is capable of lifting the largest Service planes with the wings folded back. These planes on reaching the flying deck have their wings extended and are then ready for flight. The total deck opening in way of the forward hatch is 56 ft. When the lift is at the flying deck level two roller platforms, each 10 ft. wide, slide to the sides and thus completely cover the well openings. When the lift is below the flying deck these platforms are brought into the centre and give a 20 ft. starting platform for the run off. It was intended that aeroplanes should alight on the after part of the flying deck, and to facilitate this at night special illuminating arrangements are provided for the guidance of pilots. In addition to the lamps at each side and across the flying deck aft to guide planes landing on the deck at night, steam jets are fitted forward at each side and at the stem for guidance in manoeuvring for aircraft during daylight. On the flying deck aft a special arrangement is fitted in the form of wire mattresses for retarding aircraft when landing. Planes that have landed in the water are specially picked up by means of two derricks with electric winches placed amidships on the flying deck, and two electric cranes abaft the hangar on the hangar deck. In addition to the stowage arranged for aircraft in the hangar provision is made for carrying aircraft on the flying deck. When aircraft are thus stowed on the flying deck, a timber palisading can be raised around this deck to act as a wind screen. The palisades are arranged in such a manner that they can be raised simultaneously 14 ft. above the deck level, and are lowered simultaneously to the flush of the flying deck. On Fig. 2 a portion of the palisade can be seen. All erections on the flying deck, such as navigating and chart house jack and ensign staffs, poles for navigating and signalling lights, are arranged so that all can be lowered flush with the flying deck.



FIG. 3—THROWING A SMOKE SCREEN ASTERN.

Two signal and wireless telegraphy masts are arranged (Figs. 2 and 3) so that they can be lowered flush with the flying deck, having special contrivances and winches for overhauling all slack rigging; this also applies to rangefinder and gun control instruments for use with anti-aircraft guns. Outside and around the flying deck is fitted a wide safety net.

The armament of the vessel consists of four 4-inch guns of special type for anti-aircraft and submarine protection, and two four-inch quick-firing guns. These are placed in suitable positions forward, amidships and aft so as to afford all-round and overhead protection.

How the Day's Work Is Divided on Board Ship

The Twenty-four Hours are Split up into Five Four-hour Watches, and Two Dog Watches of Two Hours Each — This Article Describes the Working of Them

By T. H. FENNER

THE creation of a deep sea fleet under the Canadian flag has aroused the interest of many people in maritime matters. Some of these, the younger ones especially, are thinking of the desirability of following a seafaring life, but very few have any idea of what life at sea is like.

Much has been written on this subject from various standpoints, usually that of some particular member of the crew.

It is proposed in this article to give a close-up view of a typical twenty-four hours on board a ship at sea. We will choose the type of ship that is predominant, the long voyage carrier, or tramp. To take life on a passenger liner and survey it closely would need the space of a whole magazine. Besides this, the liner is in a class of her own,rules and regulations approximating more closely to Royal Naval style. It is not to be inferred from this that discipline is lax on the cargo steamer, for this is not so, but there is not the same demand for governing minor details of conduct.

We will therefore take a vessel between five and seven thousand tons deadweight capacity, on a voyage, say from London to Shanghai. We will assume she is going down the Indian Ocean bound for Colombo, Ceylon, for coal. Weather conditions are perfect. It is hot, but not too hot for comfort. Sea and sky are calm, and as Kipling's homeward-bound soldier says:

"The Indian Ocean sits and smiles,
So soft, so bright, so bloomin' blue,
There ain't a wave for miles and miles,
Except the jiggle from the screw."

Day Starts at Noon

We will start our day in accordance with sea-going practice, which always counts from noon to noon. For some minutes previous to the hour, there has been a sort of simmering activity not noticeable at other hours. The members of the crew who are to go on watch at noon have had their meals at seven bells so as to be ready. They are leaning over the rail or hanging round the fidley. The captain and first and second officers are on the bridge, sextants in hand. The third officer is in charge of the bridge and is waiting for the word that proclaims noon, by the sun. Down below the same restlessness prevails, the fourth engineer waiting anxiously for the signal, the third standing on the top platform ready to go below and relieve the fourth, while in the stokehold the firemen are putting deft touches to their fires in preparation for their relief. The culinary department are busy in cooking the noon meal, and the steward is seeing that the saloon table is laid and everything in order. The messroom steward is looking after the engineers' messroom table.

At last the sun proclaims it is noon. The captain and his officers lower their sextants and take some notes. The third officer runs to the engine-room telegraph and gives several rings by moving the handle from full ahead to full astern and back. The engineer on watch rings back in response and hastens to read the revolution counter and enter it on his log. He also corrects the clock. In the meantime the second mate has gone aft and read the dial of the patent log, and the new day has commenced.

The moment eight bells are struck the man at the wheel, lookouts, firemen, greasers, officer of the bridge and officer in the engine-room are relieved. The "idlers" knock off work for their dinner-hour. The word idlers is not used in the sense that it is ashore. An idler on a ship is one who does not keep a watch but works from six in the morning till noon and from one till six, with twelve hours' rest, unless in case of emergency. The idlers are usually the bo's'un, carpenter, lamptrimmer, and a couple of seamen in the deck crowd, while the donkey man or storekeeper, perhaps both, are the idlers in the engine room.

The First Watch

The skipper and his two senior officers are now working out their calculations to find the ship's position and the amount of the day's run. The chief engineer has received the engine-room log slate from the fourth engineer as he comes up the ladder after being relieved. He will transfer this on to his log, and from this he will take an abstract at each port and send it to the owners. The engine-room log shows, watch by watch, the average steam pressure, revolutions per watch, average revolutions per minute, temperature of sea-water, temperature of hotwell, average condensor vacuum, oil and stores used, and any orders received by telegraph from the bridge. Pumping of hold bilges, filling or emptying of tanks, time evaporator has worked to supply fresh water to the boilers, etc.

By the time this work has been done it is one bell, or 12.30, and dinner-time has arrived. If the third mate is still on the bridge he remains there while the second mate takes dinner. If the second mate has relieved him before this, the third has to go back and take the bridge. In the engine room the fourth engineer who has come off watch at 12, goes below again to relieve the third for dinner.

The captain, mate, and second mate dine together in the saloon. The chief, second and third engineer dine in their own messroom. The petty officers, both of deck and engine room staffs, eat in their own rooms,the bo's'n and carpenter sharing a room together on the starboard side of the foc's'le head and the donkey man and storekeeper sharing one on the port side. The firemen's foc's'le is almost invariably on the port side, and the sailors' on the starboard side.

While the engineers are enjoying their dinner a cabin boy comes along to the mess-room with a slip of paper from the captain. This contains the ship's position and the day's run as worked out from the observations, and is sometimes the source of congratulation and sometimes otherwise. Knives and forks are temporarily laid aside while the chief opens the slip and reads it aloud. Now the interest is displayed not only on account of a natural wish to know how well or poorly the voyage is progressing, but also on account of the relation it bears to the distance run by the engines. This distance is always greater than the distance run by the ship unless there is a following current. In this case the distance run by the ship will be greater than that run by the engines as measured from point to point, but the distance through the water will still be more by the engines than by the ship. The same applies to the patent log. With a following current the log will show only the distance run through the water, the distance as from point to point being greater, while with a head current the log will show the distance run through the water, plus the speed of the current.

The distance the engines have run is the number of revolutions multiplied by the pitch of the propeller, and the difference between this and the ship's run is the slip of the propeller. If the run is poor the chief says at once that it's what he expected. He has been watching the steering and the ship has been making an S in her wake whenever he looked. The second corroborates this by saying that the steering engine has been going hard aport to hard a starboard all through his watch, and the ship has been making ten knots to cover eight. However, these are time-honored criticisms and don't mean much. A story is told of a deputation of passengers presenting the captain of a liner with an address as an appreciation of the speedy run. The chief engineer, being called on for a few words, says he does not wish to mar the harmony of the occasion, but feels it his duty to say that his engines were in port over twelve hours ago.

To come back to our subject. While the officers and engineers have been dining, the routine work of the crew

has been going on. The firemen and sailors who go on watch at noon have had their meal at seven bells, so they are ready for relief. On deck one man relieves at the wheel and one man goes to the foc'sle head as look-out, or is supposed to. Very often in fine weather the look-out is dispensed with and the man put on other work, the officer on the bridge keeps the look-out. The man at the wheel is relieved every two hours, and puts in the other two hours of the watch as look-out or on work around the decks, if weather permits. There are probably four men in each watch, and these are kept busy at work chipping or painting, splicing, overhauling cargo gear, etc. The sailors keep four hours on and four hours off alternately. The bo's'un will have a couple of men to work day work, and he takes the men on watch sometimes as well. Down below the firemen, as soon as they go on watch, proceed to clean fires, and it is then that by standing at the fidley grating that one may acquire a technique in profanity that, though perhaps seldom used, can never be forgotten. Between the front of the boiler and the stokehold bulkhead may be 7 or 8 feet, and when the fire is being cleaned the hot clinkers and ashes are raked from the furnace on to the plates at the man's feet. They are then doused with water, and clouds of steam and sulphurous vapor arise and pervade the confined space. The long slices and rakes that have to be handled are heavy and awkward, and the heat is terrible. No one has ever seen a deepsea fireman past middle age. They don't last, unless they are steady, reliable men, who get promoted to greasers and leave the stokehold. It is not infrequent, in very hot weather, to see the firemen hauled up the ventilator in an ash bucket, even his iron frame having collapsed under the strain. No wonder they go on a jamboree when they get to port. It is a natural reaction.

The fires cleaned, the next step is to get rid of the ashes. If the ship is fitted with ash ejectors this is a simple proposition, if not, the ashes have to be heaved up in bags or buckets by a hand winch fitted in the ventilator and dumped overboard by hand. In bad weather this is an especially arduous job, for the buckets are heavy, and handling them from the fidley grating to the ship's side when rolling heavily is no easy job. The men on watch load the buckets and the men on the previous watch come along to do the heaving up and dumping. This job done, the stokehold settles down to normal. The firemen, two in number, take three fires each, and the trimmer vanishes into the bunker to trim coal for the firemen to burn. He works first the port and then the starboard side, or vice versa if the wing bunkers are being used, according to the trim of the ship in a thwartship direction. He takes his barrow and wheels the coal along to the stokehold bunker door and gets a good supply there and then trims it out on the plates. His job is worse than the firemen's, for if the coal is well back he has to keep going pretty steadily, and if using Welsh coal, every move he makes is accompanied by a choking cloud of dust.

When the third engineer descends the engine-room ladder at 12 o'clock, his first duty and precaution is to ascertain that all is correct before taking charge of the engine room. To do this he makes a complete tour of the engines, feeling every bearing to note its temperature, glowing through the boiler gauge glasses to see they are in good order, noting that the water service on those parts of the engine such as guides, thrust block, etc., is regular. He takes a hand lamp and looks into the port and starboard bilges to see they are dry, and listens to the clack of the bilge pump valves to be sure they are working. He tries pit cocks on circulating and feed pumps, and then goes down the shaft tunnel to the extreme end, where he makes sure the stern gland is not leaking too much, or running warm if not leaking. He feels all the tunnel shaft bearings, and emerges once more on the starting platform. Here he exchanges notes with the fourth and examines the revolution counter to see the fourth has stolen no revolutions from him by taking too high a reading. In the meantime his greaser has been examining the oil boxes on the bearings, seeing the woollen siphons are O.K. and the boxes filled with oil. He reports to the third all correct, and the third then accepts the watch from the fourth. If anything heats up or goes wrong two minutes after, the third is responsible and cannot say it was not right when he came down.

The officer relieving the bridge, that is the second officer, gets from the third the course to be steered, set of currents, if any, points of land to look out for, and any general instructions that have been left by the skipper or first officer concerning the navigation.

We left the senior officers and engineers at dinner with the juniors, in each case, relieving the watch. Dinner over, the officer and engineer on watch resume their duties and the juniors take their meal in solitary state, each in their respective places. After their dinner both are off watch till 8 p.m., technically. Actually there is usually a couple of hours' work to do. The third mate possibly has some flags to repair or superintend a bit of work around the deck for the chief officer. The fourth engineer has some work to do on the cargo winches, or an auxiliary to pack in the engine room, evaporator to clean; anything to keep him from feeling he is idle. Working off watch is known in sea language as a field day, and whether they come every day or not depends on the chief engineer or first mate.

The officer in charge of the bridge has little to do but walk up and down and look as handsome as he can in white duck and a solar topee. He usually has an awning over the bridge to keep the sun off, and a squint at the compass as he passes to and fro is all he needs to show him if the course is being held. He keeps a look-out for passing or approaching vessels, and waits for eight bells. The engineer on watch, with his 1,500 or 1,800 horse power to look after, has plenty to do. He has to see that the firemen keep up the steam, look after the bilges, take temperatures of sea and feedwater, and generally keep things going. What time he has to spare he stands under the canvas windchute and tries to get a breath of fresh air. The temperature on the bottom platform is between 110° and 120°, and round the back of the engines and on the middle grating considerably higher. However, being used to it, it doesn't bother him much. If his friends at home, who only see him dressed smartly like themselves could see him now they would hardly know him. A pair of faded dungaree pants held up by a belt, a thin undershirt minus sleeves, and the breast wide open, bare feet thrust into an old pair of engine-room slippers, complete his costume. Sweat pours from him continuously and makes a little pool where he stands. His hair is clipped short like a convict, for long hair is an abomination in a hot engine room; but if you were to ask him if it was very hot below,he would answer in all earnestness, "Oh not so bad. When I was in the old —— we used to shiver if it went below 110°."

At seven bells, in British ships, afternoon tea is served officers and engineers. The messroom steward brings it down to the third and then calls the second, who has been asleep. At a quarter to four, one bell is struck to prepare everybody who is going on watch, and at eight bells the relief takes place.

The First Dog Watch

The firemen, unlike the sailors, work in three watches, four on and eight off. The sailors who came off watch at noon go on again at four, but the firemen who came off at noon are free till eight. This is on account of their much harder work. The officers and engineer officers also have four on and eight off, unless there are only two officers carried, which is unusual. The object of the dog watch is to change the watches round so that the sailors on watch from 12 to 4 one day will be on watch from 8 to 12 the next day. This is done by splitting the 4 to 8 evening watch into two, from 4 to 6 and 6 to 8. Officers and engineers always keep the same watches, but the firemen are changed two or three times a voyage, when in port. The second engineer's watch of firemen go on the third's watch, and the fourth's men go on the second's, while the third's gang go on the fourth. There is a reason for this. The men on the second's watch are known as the black pan watch. They have to keep the cook's galley supplied with coal, and in return receive the black pan. This is nothing more or less than extra rations, of the same quality as served to the officers and engineers, and is much appreciated by the black squad. Then again, nobody wants to be on the 12 to 4 watch, and the change makes them all have a turn at it. Further, the men who have had the 8 to 12 watch one way have been affected by the change of time, getting a short or long

watch as the case may be, and it is usual to arrange that they get compensated for this by having the opposite effect on the return journey.

The chief officer relieves the second and the second engineer relieves the third. About 4.30 the carpenter, who has been busy all day long doing odd jobs around the decks or making new hatch covers, or some such work, takes his sounding rod and line, and proceeds to sound all the hold bilges and ballast tanks. Naturally he cannot get below decks to do this, but pipes are led up to the main deck from all holds and tanks, closed with brass caps. He takes off the cap, chalks his sounding rod, and lowers it down the pipe till he feels bottom. He pulls up again and notes the height of the water. After he has made all his soundings, "Chips," as the carpenter is always called, descends to the engine room and marks all the soundings in chalk on a board hung up for that purpose. It is the second engineer's duty to carefully read this and do whatever pumping may be necessary. This is done night and morning on the second's watch, and it can easily be seen if any leakage is occurring anywhere.

The bo's'un also reports to the mate on the progress of his work around the decks and receives orders for the next day. At 5.30 the idlers knock off, and it is usually at this time tea or supper, as you like, is served. The same process is gone through. The second mate relieves the bridge and the third engineer the engine room. The sailors who are on the second dog watch get their food from the galley, also the firemen who are to come on at eight. Bo's'un, carpenter, donkey man, etc., also get their meals. By the time this is over it is four bells, or six o'clock, and the second dog watch is commenced.

The Second Dog Watch

The second dog watch ushers in what has always seems to the writer the most enjoyable part of the day in tropical waters. By one bell (which is 6.30 in the second dog watch) the third engineer and second mate have had their meals. The engineers' messroom table has usually been placed out on deck, the messroom being too hot to eat in. The third mate and second mate, chief engineer, third engineer, and fourth are usually to be found seated on and around the messroom table on the after end of the bridge deck. The sun has gone down below the horizon so quickly you can almost hear him drop, for there is no twilight in these latitudes. If the chief steward is a decent chap he will join in, and in one ship I sailed in the bo's'un was privileged to join the circle. This was unusual, but so was the bo's'un. He possessed a fund of anecdote, which, could it have been preserved and reproduced in his own language, would have had Clark Russell and W. W. Jacobs among the also rans. In two voyages, one of eleven months and one of seven months, I never knew him to repeat himself. At sea, where everyone knows each other's yarns after the first week, this was a Godsend.

With the going down of the sun a welcome coolness has ensued. The stars are shining brilliantly while over the edge of the horizon a segment of moon is showing. The sea is faintly phosphorescent, while now and again a sudden flash marks the flight of a flying fish. Pipes are going well, and some good-natured chaff is being passed around. A voice breaks in, "When I was second of the ——," and a yarn is launched. Everyone sits back to listen, the beat of the engines making an accompaniment to the voice of the yarn spinner. The moon climbs up higher and lays a fairy path over the enchanted sea. It is a magical hour, the memory of which can never fade from the mind of one who has shared it.

One bell. The sound breaks in on the little group, and there is a general shirt. The third mate and fourth engineer are to go on watch in 15 minutes. The second mate and third engineer turn in to get a sleep before their turn comes at 12. The bo's'un goes forward to his own room.

Eight bells, and again the reliefs on deck and below. Now there is a lookout on the foc's'le head, as it is dark. He must report every half hour to the bridge, singing out "——— bells and all's well," also if he see a light he must strike one bell if on the port bow, two bells if on the starboard bow, and three if right ahead. The other men on watch keep handy, and if the officer on the bridge needs them he blows a whistle.

On the eight to twelve watch the chief engineer usually takes a walk round the engine room. It is his watch, really, but of course he never stands a watch unless in case of sickness. The fourth follows him around with his eyes and wonders when the day will come when he will ocupy the position and be the autocrat of half the ship's company, and supreme in his own department. If the chief is in a good humor he stops and has a few words with his junior, and if not he may stop and have a few words anyway. Fourth engineers get wise to the indications and usually find it necessary to go down the tunnel or round the back platform if the signs are not good.

Satisfied with his tour, the chief ascends the ladder, mentally congratulating himself he doesn't have to stop down there in the heat. The second and he, and perhaps the first officer, have a chat till about 10 o'clock and then the two latter turn in as they have to be out at 4 a.m.

The chief usually does not turn in till the watch is over in case something arises that the fourth is unable to handle. Steward, cabin boy, messroom steward and cook have all turned in. They have been busy since early morning with their duties, which are in line with those of the housemaids. But here let a word be said for the much-abused cook. He has the hardest and most thankless job in the ship. He has got to achieve miracles if he is to please all hands, which incidentally he never does. I have seen the firemen lined up one side of the galley and the sailors the other, bombarding the hapless cook with bread of his own baking. He has to work no matter who else has a holiday, and in bad weather his job is a nightmare. "God sends the food and the devil sends the cooks" is the usual opinion among sailors, but he usually does the best he can and takes the abuse like a true philosopher.

The night goes by with the first and second watch, that is 12 to 4 and 4 to 8. The 12 to 4 is known as the "gravy-eyed" watch, man's vitality usually being low at these hours. At 6 in the morning activity breaks forth again, a sailor going down to the engine-room with a request for water on deck. The second engineer starts the ballast pump, and for the next two hours the deck crowd are busy washing decks and cleaning up. At seven bells the fourth engineer and third mate are roused to take their breakfast and be ready to go on at 8 o'clock. The second engineer and the mate have had coffee and toast served them at 6 o'clock, and the second engineer has been busy pumping out tanks, serving out the supply of oil for the day, etc., while on watch. The mate has worked out an observation for longitude from a star during his watch, which will be used later with the observation obtained at noon.

After breakfast the third engineer will be busy on deck or below. The second will look around and find jobs for the third and fourth. The fourth will test the density of the boilers under supervision of the chief and perhaps inject some soda into them. The skipper will be on hand to prescribe for anyone sick or to hear complaints, after which he will bring his official log up to date, entering all the happenings of the twenty-four hours. This will bring us round to noon again, and a day is completed.

This is a typical day in fine weather without unusual circumstances. In bad weather or due to a breakdown there will be no watches. Everyone is on from "12 to 12 and relieve yourself." It must be remembered there are no specified hours of labor at sea, but everyone must work whatever length of time is necessary to the ship's safety. As their own safety is bound up in the ship's there can be no legitimate kick about this rule.

However, bad weather is not the rule but the exception in most trades. The North Atlantic is perhaps the worst of the many routes there are, but one is liable to strike a breeze of wind anywhere on the seven seas.

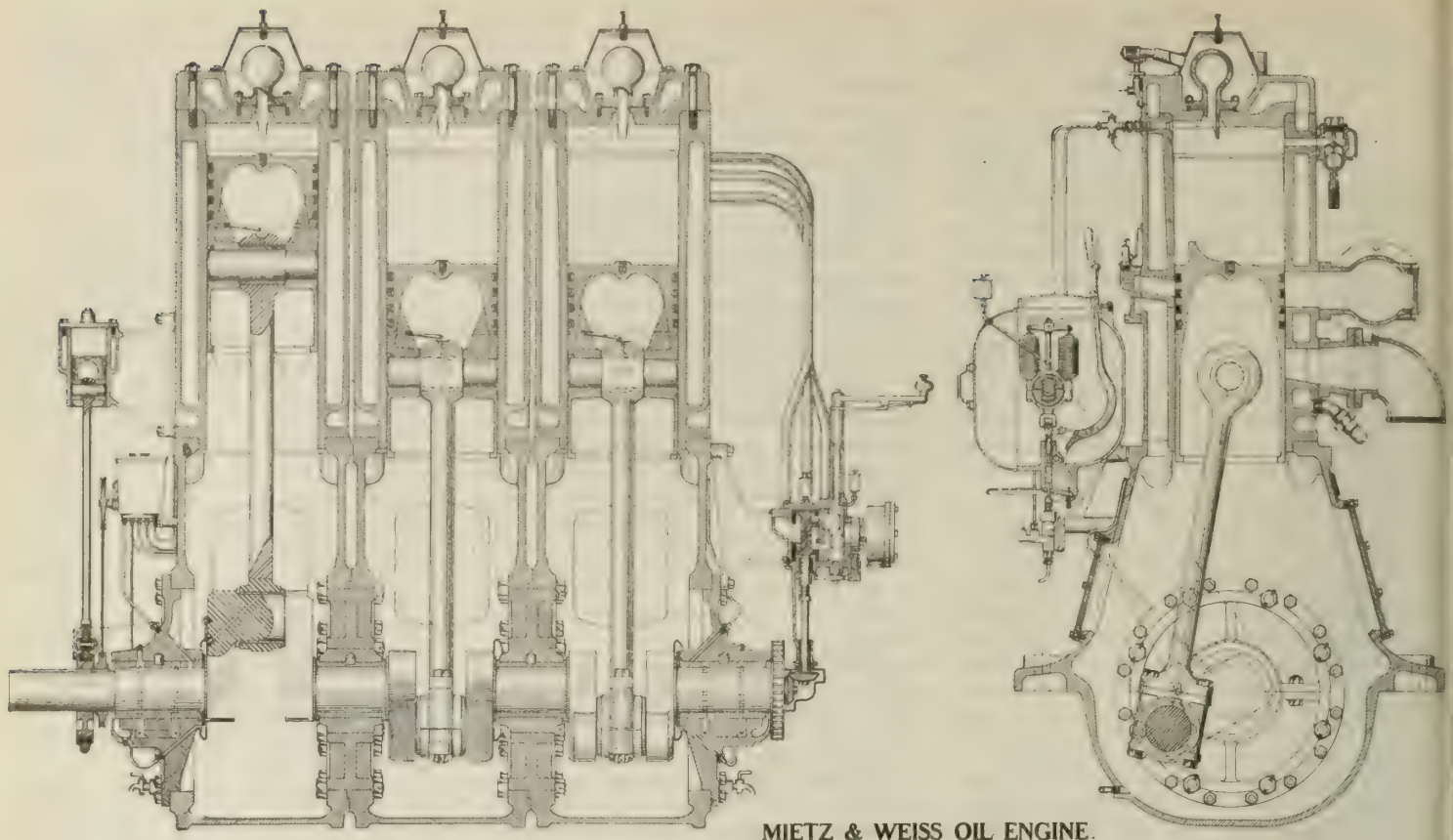
And remember, the last gale of wind is always the worst you ever saw.

QUICK DESPATCH

An item in an English shipping journal gives an account of some lively cargo handling:

The steamer "Carventum," loaded with 6,600 tons of sugar in bags from Mauritius, and 100 tons of Government stores, was discharged in 41½ working hours in the East India Dock, London.

This was at the rate of 162 tons per hour, or 1,782 tons per day.



MIETZ & WEISS OIL ENGINE.

REVERSIBLE - TYPE.

LONGITUDINAL AND TRANSVERSE CROSS SECTION.

MIETZ AND WEISS OIL ENGINE

The internal combustion engine illustrated and described here, is manufactured by Mietz and Weiss, New York.

The engine is the three-cylinder, two-cycle type, working with a medium compression. Ignition is obtained by means of a hot bulb, the fuel oil being injected just before the completion of the compression stroke. It is claimed that the medium pressures used tend to increased reliability of the engine, as the excessive bearing pressures, stresses on the engine frame, and lubricating troubles are eliminated.

A good instance of the durability of this type of engine is shown by the fact that one of them, built in the year 1895, has been running ever since without repair, and is still on duty.

As can be seen from the cut, moving parts are cut down to a minimum. Outside of the cranks, connecting rods, and pistons, the only other parts are a reversing device and the pump, which is controlled by a governor.

In the smaller sizes of engines the reversing is affected by gearing outside the engine. In the three-cylinder style the reversing is direct, being controlled by a distributing valve, which is worked by the lever shown in the cut. With the lever in central position the engine is stopped, while moving it to either extreme position starts the engine in either ahead or astern direction. The speed of the engine is regulated by the governor acting on the throttle, which proportions the amount of fuel oil to the load.

Lubrication to all parts of the engine is effected by a positively driven, valveless, force feed lubricator. The only attention required is to occasionally replenish the supply of oil in the lubricator tank. The main bearings are furnished with the ring type of oiler, and the method of lubricating crankpin and crosshead can be seen in the cut.

These engines are built to operate on kerosene, fuel oil, distillate, crude oil, or alcohol. They operate very successfully on low grade oil, consuming about 6 pounds fuel per horsepower hour.

Particular attention has been paid to the balancing of the moving parts, accurate balance weights being attached to the crank webs. In engines where a flywheel is used, they are turned and finished all over, and carefully balanced. These precautions tend to reduce vibration to a minimum.

The cost of operation is said to be low, due to fuel economy, low cost of attendance, and maintenance. Owing to simplicity of construction and small number of moving parts, it is not subject to long shutdowns for repairs.

The United States Government have installed this type of engine in a number of lightships, the 100, 150, and 200 horsepower sizes being used. The total number of engines of this type in the United States Government service is considerably over one hundred.

This is an interesting example of the two-cycle, direct reversible, semi-Diesel engine.

STEAM JET AIR PUMPS

Preliminary Bulletin No 113, illustrating and describing the Wheeler Steam Jet Air Pump, now being distributed by the Wheeler Condenser & Engineering Co., Carteret, N. J.

This patented Steam Jet Air Pump includes the valuable features of two or more steam jets working in series with a condenser between the jets—a feature which enables this type of pump to perform a given duty more efficiently than any steam jet pump not so equipped.

The bulletin explains the operating principles, gives reasons for high efficiency, minutely describes the inter-condenser, cites an interesting case of unprejudiced testimony and shows an operating test curve. It includes a cross sectional drawing and shows how to connect double machines or triple machines to surface condensers. The pump is applicable to jet condensers, as well as to surface condensers.

THE MERCHANT MARINE

The First Lord of the Admiralty said in the House of Commons, March 1919, that no merchant ship had ever failed to sail owing to the lack of men, although there were men who had been torpedoed as many as five times. The Empire, he added, might well be proud of this unbeatable record. THE MERCHANT MARINE DID ITS DUTY.

Electric Drive from a Military Point of View

By COMMANDER S. M. ROBINSON

Bureau of Steam Engineering, Navy Department

ANY type of propelling machinery, to be acceptable for a capital ship, must be entirely satisfactory in the following particulars:

(1) Reliability
(2) Weight and space occupied.
(3) Economy.
(4) Flexibility of installation.

Needless to say, the most important of these is reliability; and no machinery should be considered at all which has not proved itself satisfactory in this respect. The performance of the Jupiter during the past five years has thoroughly proved the reliability of electric machinery on board ship. For demonstrating this quality, the Jupiter was a good type of ship to select, as a collier ordinarily does a great deal more cruising than a capital ship. During the past five years the Jupiter has been held up only once on account of trouble with her electric equipment, and in this case the delay was for only two or three hours and the repairs were effected by the ship's force with the facilities available on board ship. The trials of the New Mexico, just completed, indicate that she could duplicate the performance of the Jupiter in this respect. In fact,, there are inherent resons why electric propelling equipment is more liable than other types of machinery. As direct-connected or geared turbines are usually arranged, it is seldom the case that damage to one turbine does not affect more than one shaft; with electric machinery, each shaft can be absolutely isolated from the others by merely opening a disconnecting switch to the motor on the shaft. Furthermore, in case of damage to a turbine with the straight steam drive, the ship is left to drag one or more propellers while driving with the others; with electric drive, the failure of one turbine will still allow the ship to be propelled by all four screws in a perfectly normal manner. The latter will be seen to be no small advantage when it is considered that the effect of one dragging screw may be as high as 15 per cent. of the total effective horsepower required to drive the ship, and to this may be added the fact that the manoeuvering qualities of the ship are not nearly as good when it becomes necessary to drag one screw. It sometimes happens that the damage to a turbine is such that the shaft cannot be allowed to revolve; in this case, it becomes necessary to limit the speed of the ship as the "jacking gear," or other locking device, is not sufficiently strong to hold the shaft at high speeds of the ship. There is still another advantage of electric propulsion that is brought out very strongly when the ship is manoeuvering in shallow or muddy water, such as obtains in harbors and their entrances; the ordinary ship uses all of her main engines, and therefore all her main condensers and auxiliaries all the time, but an electrically driven ship need use only one turbine, condenser, and set of auxiliaries and the other can be kept as a standby. If the steamdriven ship runs into mud, she will probably plug up all her condensers at the same time, or even if she only plugs one she will temporarily be deprived of the use of one or more shafts and this may be fatal for manoeuvering in restricted waters. As an actual experience the New Mexico while entering New York harbor had to shift main generators twice owing to the plugging of her condensers with mud and these shifts were made so quickly that they did not affect the operation of the ship at all. There is one other point that adds to the reliability of electric drive, and that is that the direction of rotation of the steam turbine is never changed; reversal of direction of rotation is the most severe of all conditions imposed upon any form of steam machinery, and its entire elimination in electric drive adds very much to the reliability of the latter.

When comparing different types of propulsion in regard to the other three points given at the beginning of this article. it is difficult to say that anyone of the three is of more importance than the others. inasmuch as the machinery must be satisfactory in all three respects; it is only where two types of machinery are nearly equally satisfactory in some of these respects that they can be directly compared in regard to the remaining points. For example, no type of machinery could be considered which was vastly heavier or occupied twice the space of other types of machinery, no mater how economical it might be, and, vice versa; the economy must be good or any question of weight saving could not be considered. Therefore, the electric drive will first be compared with other types of machinery in these two respects before proceeding to a consideration of its relative advantage as to installation. It is difficult to arrive at exact comparisons with other types of manchinery in regard to weight as, so far, we have built no capital ship with geared turbines arranged on four shafts and therefore are unable to get a direct comparison of the two types of machinery; but, from the data at hand, it is not believed that there is any very great or important difference between the electric drive and geared turbines in regard to weight, although it seems to be fairly certain that the geared turbine has a slight advantage in this respect. In regard to the question of floor space occupied, it is not believed there is any great difference, and what difference there is is probably in favor of the electric drive. It is at least safe to say that so far as weight and space occupied are concerned, the difference is not great enopgh to be of much importance.

As to the relative economy of electric and geared drives, we are able to make a little more definite statement than in the case of the weight comparisons. It seems fairly certain that in the case of large horsepower installations with large speed reductions, such as are found on battleships and battle cruisers, the geared turbine will have a slight advantage at full power, but at the lower speeds of the ship the electric drive will have a very material advantage over the geared installation. Just how great this advantage will be will depend to some extent upon the arrangement of the machinery. For example, on a battle cruiser developing enormous horsepower at full speed, and where it would be necessary to use all of this transmission gearing at the cruising speeds of the ship, the saving by the use of electric drive would be very much greater than in the case of a battleship where the percentage of reduction of power would not be so great. In connection with the subject of economy, it is interesting to compare the trial results of the Pennsylvania and the New Mexico. The Pennsylvania is fitted with direct-connected turbines and small geared cruising turbines which can be run up to speeds slightly above 15 knots. The trial results of the two vessels show that in total fuel consumption the New Mexico saves mohe than 20 per cent. over the Pennsylvania at speeds from 19 knots to full power. At a speed of about 15 knots, which is about the limit of the geared cruising turbine and also of the low-speed connection of the electric drive, there is a very much greater saving, it being something in the neighborhood of 30 per cent. At ten knots, the fuel saving is apparently very small, although at both 10 and 15 knots the trial results were not directly comparable on account of the different conditions under which the trials of the two ships were run. Ships fitted with small geared cruising turbines, however, showed remarkably good economy at very low speeds of the ship, such as 10 knots.

It therefore appears that electric drive, generally speaking, is quite satisfactory in regard to points (1), (2), and (3), and compares very favorably with other types of propulsion in these respects. It may, therefore, be compared directly with other types of machinery in regard to point (4), the "Flexibility of installation." The tendency in building modern capital ships is to provide for more and more torpedo protection and it becomes necessary to crowd the machinery away from the sides of the ship as much as possible. This arrangement is also desirable from the point of protection against

gunfire for a similar reason. In this respect, electric drive has an enormous advantage over any other type of machinery in which the prime mover is mechanically connected to the propelling shaft. The main turbine-generators may be placed in any part of the ship that is most desirable; they may be placed in compartments forward of each other and they may be raised up enough to place the main condenser underneath them—in fact, there is practically no limit, other than the head room, as to the position of the main turbine-generator in the ship. This gives an enormous advantage to electric drive over all other types of machinery and enables the Naval Constructor to give far more adequate protection to the ship and machinery against damage by torpedo and gunfire. Those parts of the machinery—the main motors—which it is necessary to connect mechanically to the shafts, are comparatively small and take up only a small space so that they can be placed in small isolated compartments which will not menace the ship in case of flooding; since no main auxiliaries are required for the motors, the flooding of a motor room will not entail any loss in that respect. Also, the motors may be placed very much farther aft than can steam driven turbines and therefore the length of the main shafting can be very materially reduced. This constitutes a big advantage; both on account of less liability to derangement of the shafting itself, due to injury to the ship, and also of less danger to the ship itself because of the shafting not having to pierce a number of water-tight bulkheads. These advantages of installation constitute the real and main reason for the adoption of electric drive for capital ships and any other advantages are minor compared with them.

Utilizing these advantages to the fullest extent makes it possible to build capital ships which are far superior to any others fitted with any other form of machinery. In addition to advantages from the point of view of protection, there are also the advantages from an engineering standpoint. The shorter lengths of shafting make it easier to keep the shafts in line; the grouping of boilers around the machinery makes short and direct steam pipes with a consequent reduction in weight and complication and a smaller drop in steam pressure. The same may be said of practically all the other piping systems of the ship, such as feed lines, oil lines, exhaust lines, etc.

C. S. Ogilvie has been appointed to the position of assistant engineer for the Ottawa division of the G. T. R. System. Mr. Ogilvie held a similar position with the same company at Belleville, but resigned to go overseas. He was a prisoner in Germany for over three years, being released after the signing of the armistice.

COMPARISON OF WELDED WITH RIVETED JOINT

The following tests were recently carried out, with a view to determining the relative strength of welded and riveted joints.

The tests were four in number, the first being on the plain steel flat, to determine the breaking strength. The breaking strengths of the welded and riveted joints were then compared as percentages of the solid bar.

The strength of the butt weld is equal to that of a triple riveted double strap butt joint of good design, while the double lap weld shows a higher percentage of strength than the usual double riveted lap joint.

Test No. 1

Plain steel flat cut from stock.

Cross section 1.94 in. x .482 in. = .935 sq. ins.

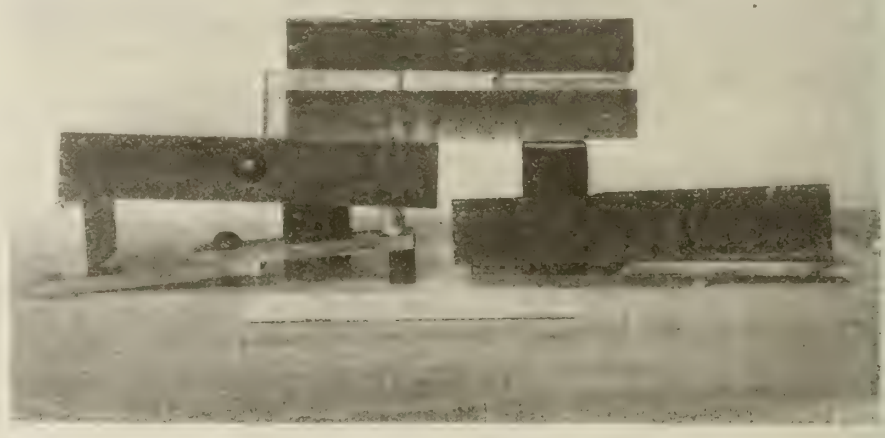
Breaking strength 49,630 lbs. =53,000 lbs. per sq. in.

Test No. 2

Plain steel flats butt welded.

Cross section 2.05 in. x .477 in. = .978 sq. ins.

Breaking strength, 45,500 lbs. = 46,500 lbs. per sq. in.



STEEL BARS FOR WELDING TESTS.

Test No. 3

Lap joint with one ¾ in. rivet.

Cross section of each flat, 2.35 in. x .486 in. = 1.14 sq. ins.

Breaking strength = 28,510 lbs.

This joint failed through the rivet shearing.

Test No. 4

Lap joint double welded.

Cross section of each flat, 2.42 in. x .478 in. = 1.14 sq. ins.

Breaking strength, 47,240 lbs. = 40,900 lbs. per sq. in.

Summary

The relative strengths are as below, based on the strength of a square inch of section. It should, however, be kept in mind that No. 3 failed through rivet shear, and that here the strength was determined by the rivet size.

Uncut metal, 100%.

Butt weld 88%.

Double lap weld 77%.

Rivcted joint 47%.

IMPORTANT DECISION IN BRITISH COURT

A decision of great interest to the marine engineering profession was recently made by the Chancery Division of the High Court.

The case was an application for the extension of the patent rights on the Mitchell thrust block. This thrust block, the invention of an Australian engineer, was practically the means of making the geared turbine possible. By its means, horsepower of over 20,000 can be transmitted by a single shaft, whereas with the old multiple block about 3,000 to 4,000 horsepower was the limit.

As to the success of the invention, an Admiralty witness deposed that the British Admiralty had in use nearly nine and three-quarter million horse power. In one cruiser the saving in first cost over the old type of thrust amounted to £38,000, and the inventor's royalty to £100.

The stopping of development in new practice occasioned by the war, in the mercantile marine, prevented the inventor benefiting by his patent. It was, therefore, claimed that his patent should be extended for from five, as a minimum, to ten years, as a maximum.

The judge, in delivering his decision, made it clear that he considered the claim justified, the only question being as to the length of the extension. Taking all the facts into consideration, he allowed an extension of seven years. Licenses to manufacture now in force will be renewed at the present rates, but any future licenses granted royalties and license fees will be charged at not exceeding twice the present rates.

Major Jas. McGregor, resident engineer of the Halifax ocean terminals, has arrived back after two years' service in the Third Battalion of Canadian railway troops. Major McGregor was engaged, while in France, in building and repairing standard gauge roads destroyed by the Germans.

Captains and Engineers Appointed on the Canadian Inland Steamships

ALGOMA CENTRAL STEAMSHIP LINE

Vessel.	Captain.	Engineer.
J. Frater Taylor	J. D. Montgomery	W. T. Rennie.
W. C. Franz	W. C. Jordan	A. M. McInnes.
Agawa	M. A. Livingstone	J. L. Smith.
Home Smith	A. McIntyre	D. McLeod.
Valcartier	J. A. Brown	J. A. McHattie.

CANADIAN PACIFIC RAILWAY CO.

Vessel.	Captain.	Engineer.
Assiniboia	James McCannel	A. A. Cameron.
Keewatin	Malcolm McPhee	William Lewis.
Manitoba	F. J. Davis	G. D. Adam.
Athabasca	Murdock McKay	Fred Merrill.
Alberta	John McIntyre	C. Butterworth.
Ontario	Robert Brown	C. A. Sullivan.
Michigan	Harry Farrow	Fred Merrill.

CANADA STEAMSHIP LINES

Vessel.	Captain.	Engineer.
America		
Belleville	J. J. Jarrell	Geo. Sauve.
Bickerdike	T. H. Johnston	Joe Aston.
Brockville		
Cadillac	W. Beatty	Hugh Myler.
Cayuga		
Chippewa		
City of Hamilton	O. Patenaude	
City of Ottawa	J. L. Baxter	John Kennedy.
Collingwood	Peter McKay	Jos. W. McLeod.
Corona		
E. B. Osler	J. H. Hudson	Jas. McGregor.
Eperor	D. W. Burke	Geo. W. Smith.
Fairfax	M. Heffernan	F. Patterson.
Haddington	R. J. Wilson	Chas. Leriche.
Home Rule (Tug)	R. D. Simpson	
Ionic	O. Wing	A. E. Crosthwaite.
J. H. G. Hagarty	C. E. Robinson	Chas. Robertson.
J. R. Binning	Raymond Hand	
Kingston	A. E. Stinson	
Longueuil	M. Manderville	
Macassa		
Martian	Robert McIntyre	Russel R. Foote.
Midland King	H. J. Aitken	A. E. Kennedy.
Midland Prince	A. B. McIntyre	J. A. Pickard.
Modjeska		
Montreal		
Murray Bay		
Pandora		
Quebec		
Rapids King		
Rapids Prince		
Saguenay		
Sarnian	Robert Pyette	I. J. Boynton.
Seguin	W. Brian	John B. McLaren.
Toiler	W. H. Montgomery	Emery Scott.
T. P. Phelan	H. A. Leaney	Thos. H. Hazlett.
Thousand Islander		
Three Rivers		
Toronto	N. McGlennon	
W. D. Matthews	A. F. MacLennan	William Reid.
W. G. Morden	G. W. Pearson	Robert Chalmers.

AMERICAN INTERLAKE LINE

Sir Trevor Dawson	H. Hinslea	W. W. Norcross.
Stadacona	G. H. Page	W. L. Shay.
Wyoming	T. B. Greenway	Geo. Schroder.

DEPARTMENT OF MARINE.

Vessel.	Captain.	Engineer.
Grenville	Richard Smith	James Leonard.
Lambton	Alex. Brown	J. M. Brechin.
Concretia	D. Mills	R. Mullins.
Scout	Cory Hart	Geo. Lessard.
Argenteuil	Thos. W. Weir	Alex. Drury.
Dollard	S. Sauvageau	W. Carpentier.
Vercheres	Adolphe Marchand	H. Robitaille.
Shamrock	A. Toupin	N. Marchand.

MARQUETTE AND BESSEMER DOCK & NAVIGATION CO.

Vessel.	Captain.	Engineer.
Marquette & Bessemer No. 2	John Van Buskirk	Thomas Elliot.
Marquette & Bessemer No. 1	James A. Patterson	Herbert Culp.

GEO. HALL COAL CO. OF CANADA, LIMITED.

Vessel.	Captain.	Engineer.
Cabotia	Walter Mills	Urcisse Hamelin.
Compton		L. Smith.
J. W. Follette	C. A. Mahoney	M. J. McFaul.
J. G. Ketchum II.	W. J. Jewett	Theo. Normandeau.
Robt. R. Rhodes	W. H. Ransom	F. A. Collier.
Rockferry	Wm. A. Tulloch	A Carrier.
Senator Derbyshire	R. Chatel	H. Lamoureaux
J. H. Hackett	Wm. Allison	Thos. Fugere.
Florence	V. Gendron	S. Legendre.
Margaret A. Hackett	M. Allison	Omer Croteau.
A. D.	Patrick Leboeuf	
Gladys H.	L. Leduc	
F. D. Ewen	Aimie Monette	
Katie H.	C. Brunet	
Zapotec	Ad. Monette	

MONTREAL TRANSPORTATION COMPANY, LIMITED

Vessel.	Captain.	Engineer.
Advance	J. V. Norris	C. W. Clark.
Arabian	Arch. N. Hogue	Gordon Stokes.
Cataract	W. Blackwell	M. J. Sherman.
Glenmount	James Reoch	Frank Moyee.
Joyland	H. A. Patterson	L. E. Spencer.
India	J. A. Lepine	J. A. Lamoreaux.
McVittie	J. A. Ferguson	W. C. Spencer.
Oatland	T. S. Patterson	W. Crawford.
Simla	C. S. Coons	D S. Simons.
Westmount	J. F. Davis	F. Norris.
Windsor	John Doyle	Ambrose Dunn.
Avon	E. J. Smith	A. Stillson.
Pawnee	A. McDonald	C. Little.

NORTHERN NAVIGATION CO.

Vessel.	Captain.	Engineer.
Noronic	A. L. Campbell	S. Brisbin.
Hamonic	A. M. Wright	John Smith.
Huronic	E. Walkinshaw	George Peel.
Waubic	John Dube	Fred. Pringle
Thousand Islander		B. J. Farrell.

SINCENNES McNAUGHTON LINES, LTD.

Vessel.	Captain.	Engineer.
Aurelie G	A. Goulet	D. Vezina.
F. Dupre	Jos. Bibeau	Ed. Mongeon.
Ethel	A. Rajette	Alf. Guilbault.
Emma L.	Elp. Blais	E. Lanneville.
Mathilda	U. Latraverse	E. Gingras.
John Pratt	Jos. Cournoyer	P. Cournoyer.
Macsinco	G. Mongeau	F. Denis.
Yvon	Z. Bibeau	A. Beaudet.
Nathalie R.	J. Millette	J. Demers.
Rosalie L.	H. Perusse	D. Laforest.
Hudson	Chas. Legault	A. Boisvert.
Muscallonge	Z. Legault	A. Baribeau.
Spray	Jos. Mongeau	E. Sauvageau.
Conqueror	A. Montpetit	T. Lagendre.
Rival	W. Bertrand	R. Boisbert.
Stella A. K.	D. Lemay	Jos. Dupre.
Myra	Z. Cadieux	A. Lemay.
No. 47 (not named)	L. Lemay	A. Desrochers.
No. 48 (not named)	P. Bibeau	F. Vigeant.
No. 49 (not named)	S. Parisien	F. Thuot.
No. 50 (not named)	C. Provencal	W. Provencher.
No. 51 (not named)	P. Paulet	Frs. Rousseau.
Sinmaco	D. Mongeau	Jos. Laviolette.

THE CANADIAN TOWING & WRECKING CO., LIMITED.

Vessel.	Captain.	Engineer.
James Whalen		
A. F. Bowman	A. McKay	Geo. Russell.
Sarnia	Geo. Stitt	Lloyd Williams.
A. B. Conmee	W. Nuttall	Jas. Kennan.
Empire	W. H. Wilson	

THE OTTAWA TRANSPORTATION COMPANY, LIMITED

Vessel.	Captain.	Engineer.
Dolphin	Zeno Lavigne	Phillippe Trotier.
Florence	Earnest Lefebvre	Albert Morinville.
Hall	J. C. Barclay	Jos. Legault.
Scotsman	Ed. Francoeur	Victor Lavigne.
Ottawan	Adolphe Mallette	Nap. Lavigne.
Glen Allan	Allan Clark	F. Pintal.

War Developements in Marine Oil Engines

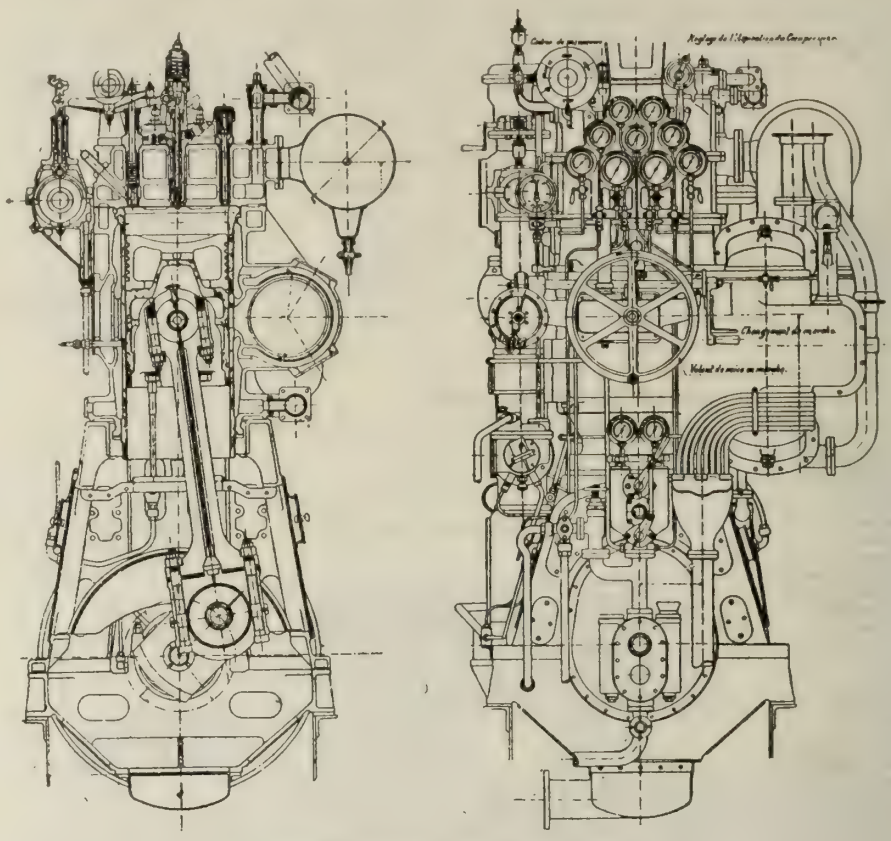
Description of a Schneider 2150 I.P.H. Submarine Diesel Engine —A Successful Type Used in the French Navy

Courtesy of Motor Ship and Motor Boat

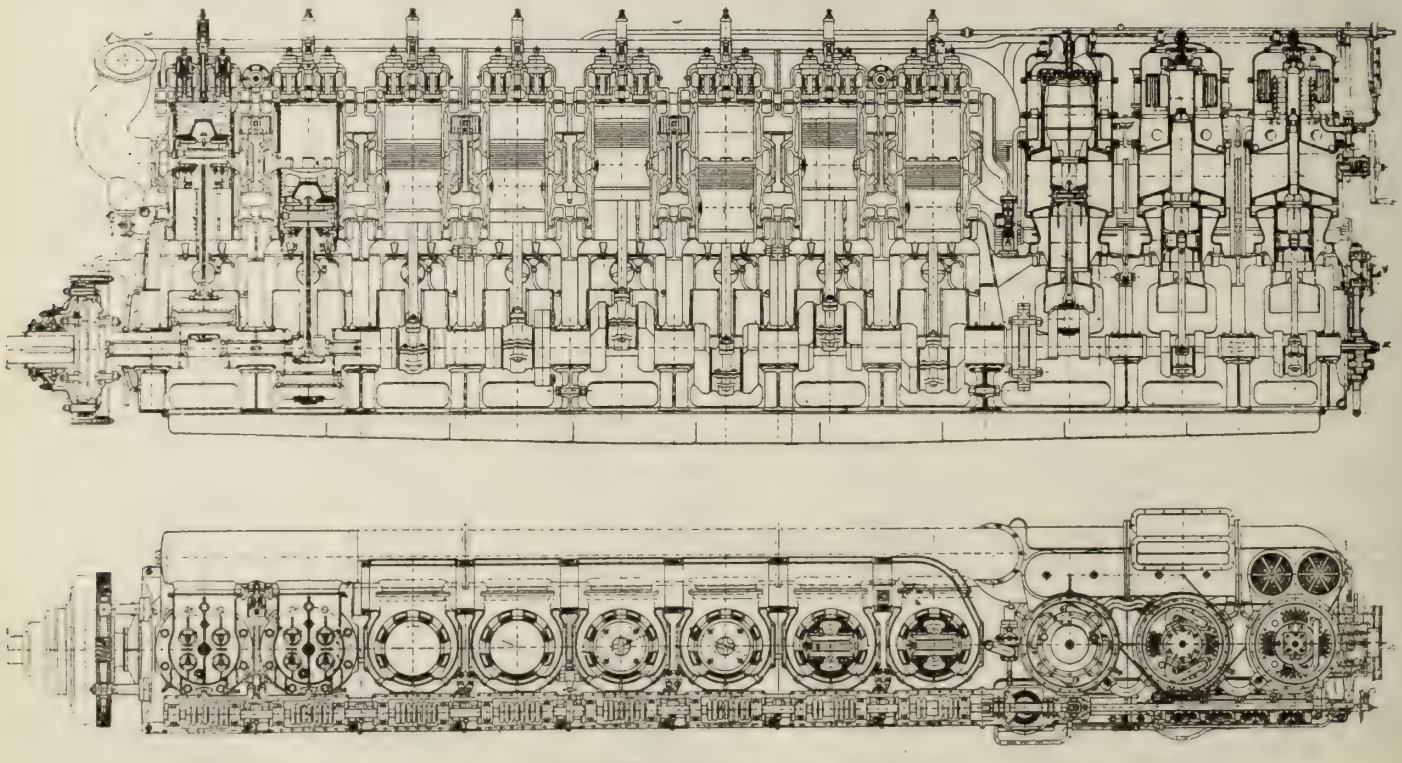
A CURIOUS development now taking place in connection with the marine oil engine is the sudden desire on the part of builders concerned with the submarine type to obtain the utmost degree of publicity for their products. In fact there appears to be quite a keen competition in this direction, with a view to using such engines for the propulsion of commercial craft and large motor yachts. This tendency is manifested here in the form of very detailed views of the latest type of naval Diesel engine made by the great French armament firm of Schneider et Cie, at Creusot. In parenthesis, it may be mentioned, that at one time during the war no fewer than 150,000 men and women were employed by this firm.

Reference to the illustrations shows that so far as the drawings are concerned Messrs. Schneider have not attempted to make a mystery out of any features of this interesting engine, every detail being shown clearly, although some of the smaller parts are necessarily difficult to make out, owing to the reduction in size entailed by the limited space available on one of these pages. Incidentally it may be remarked that the engine about to be described is by no means the largest made by Messrs. Schneider, two 8-cylinder sets installed in the French submarine "Nereide" being rated at 2,400 b.h.p. each.

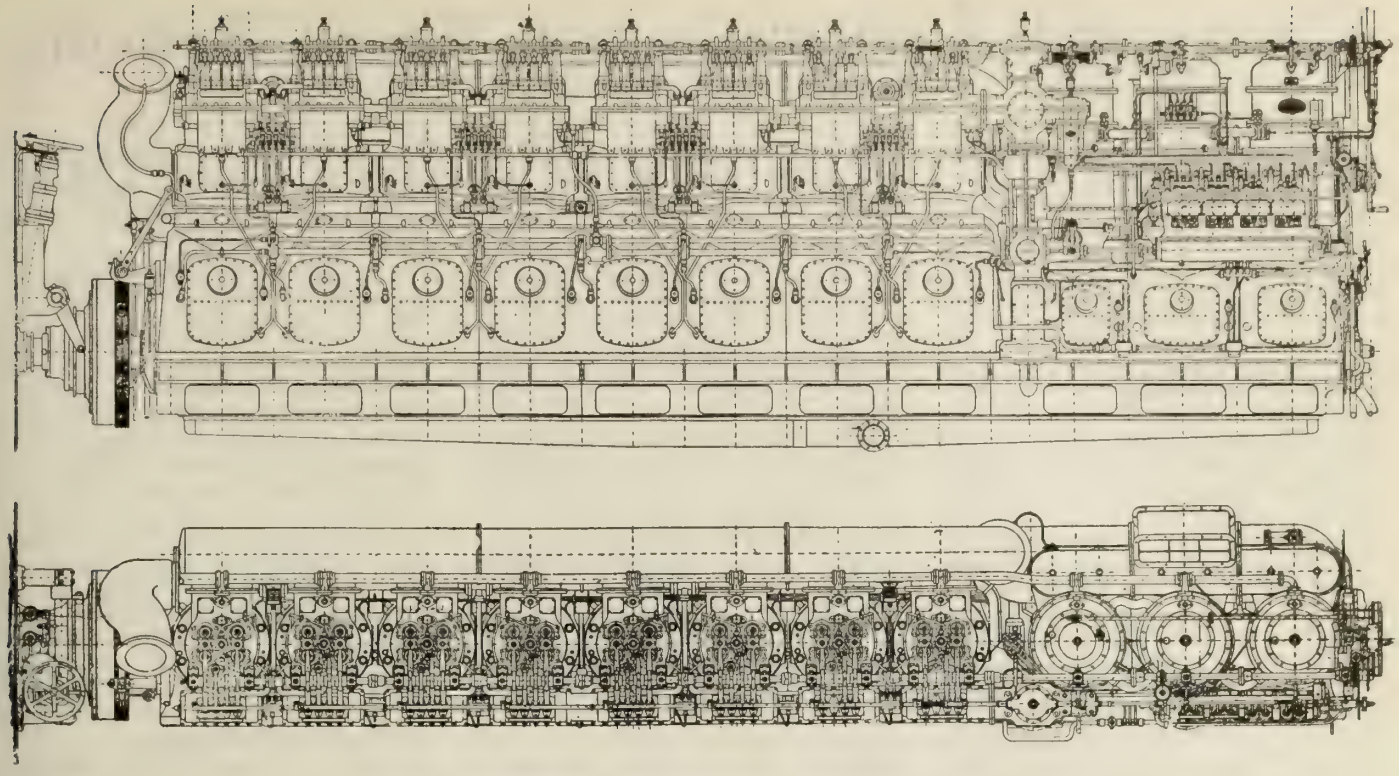
The engine is of the 2-stroke type with 8 cylinders, the scavenging air be-



CROSS SECTION AND FRONT END.



ELEVATION AND PLAN.



SECTION OF WORKING CYLINDERS AND SCAVENGING PUMPS.

ing supplied through four valves in each cylinder head. At the forward end of the engine are three scavenge pumps, driven by three smaller cranks at the end of the main crankshaft, and having above them the three stages of the air compressor. The cylinders are of cast steel and fitted with cast-iron liners, and they are carried on a cast steel framing made in four pieces longitudinally and bolted together, the forward and part of the next section being under the scavenging cylinders and compressor. Cast steel is also used on the bedplate, which is made in three sections. As will be seen in the sectional illustration the main crankshaft is in one piece with a flange coupling at each end of it. At the after end will be seen a sliding pin clutch, whereby the intermediate shafting can be disconnected when the engine is fitted into a submarine, thus allowing the electric motor to run without the engine. The working cylinders have a bore of 410 mm. (16.14 ins.) with a stroke of 450 mm. (17.7 ins.), and the 8 together develop 1,500 b.h.p. at a speed of 330 r.p.m., the i.h.p. being 2,150, assuming a mechanical efficiency of just over 69 per cent. The brake mean effective pressure works out to 62 lb. per square inch, which is a distinctly low rating, when one considers that the brake m.e.p. of the White heavy type Diesel engine described recently was nearly 67 lb., this engine being of similar type excepting for the stepped pistons which act as scavenging pumps, while the horse power developed was only 125 h. p. per cylinder against 181 in the Schneider model.

The camshaft is arranged at the starboard side of the cylinder heads. It is driven by bevel gear off the upper end of a vertical shaft, of which the lower end is operated by skew gear from the crankshaft. The four scavenging valves on each cylinder are operated in pairs and cams are also provided for the fuel valve and air-starting valve. In this engine two cams are provided for each bell crank lever, one for running ahead and the other for going astern. The fulcrums of the rocking levers consist of adjustable cams upon a manoeuvring shaft, a movement of which raises the rollers off the cams, so that the camshaft can be moved endways for reversal. The two pistons are of trunk type and made in two parts, and the heads are oil-cooled through telescopic pipes. All the main working parts are under forced lubrication, for which and for oil-cooling the pistons oil is supplied by the gear pump at the forward end of the air compressors. The eight fuel pumps, one for each cylinder, are mounted at the forward end of the engine in front of the scavenging pumps. They are driven by eccentrics on a counter shaft which is operated by bevel gear on the vertical shaft. Governing is effected in the usual manner by holding open the suction valves of the pumps. Provision is made for doing this by hand, by the manoeuvring camshaft and by the governor. The fuel valves are of special type. Reverting to the rocking levers and their fulcrums upon cams on the manoeuvring shaft, it will be readily understood that by a suitable arrangement of these cams certain valve rockers can be disengaged while others are still being operated by the main cams. By these means the fuel valves of four cylinders can be cut out of action and the starting valves put into commission, this arrangement being reversed so soon as the engine is well under way. The manoeuvring shaft is operated by the hand wheel to be seen at the forward end of the engine, the transmission being on skew gear. The camshaft is moved endways to bring into engagement the ahead or astern cams, by two small hand wheels, the gear being interlocked with that of the manoeuvring shaft. We understand that a number of Schneider engines of this type have been fitted into French naval craft.

The Morse Chain Company, Ithaca, New York, for which Jones & Glassco, Montreal and Toronto, are the Canadian agents, have issued publication Number 16, entitled "A Chain of Evidence." This publication is one of a series and deals particularly with the small power drive. The book is replete with illustrations and is of interest and of useful reference for those who have to deal with the transmission of small amounts of power.

The Goldie & McCulloch Co., Galt, Ont., have recently issued a catalogue on rotary jet condensers and vacuum pumps. This firm have obtained the rights to the Rees-Roturbo pumps and condensing equipment and this catalogue deals with the various types of condensing equipment which they are prepared to supply. Condensers in general are treated of. Condenser plant economies and the economy of high vacuum are shown. The Rees-Roturbo jet condenser is treated of in detail, its design being gone into thoroughly, and features of installation being dealt with in a very thorough manner.

Eastern and Western Canada Marine Activities

APRIL CORRESPONDENCE

EASTERN CANADA INCREASES ACTIVITIES

THE opening of navigation has again given the port of Montreal the appearance of a busy spot, and preparations are rapidly progressing for an active season. Work has been going on for some weeks getting the harbor sheds and yards in shape for the coming season and the officials are busily awaiting the arrival of the first overseas boat to inaugurate what might be termed the official opening of the port, when the ceremony of a presentation of a gold-headed cane is made to the first overseas captain that docks his vessel in the harbor. The ice has been out of the river since about the middle of the month and the harbor officials are anticipating an early and exceptionally busy season throughout the navigating period. It is expected that a large percentage of the cargoes to leave Montreal this year will consist of food and building material, to assist in the restoration to health of the people and industry of those sections of Europe that have been devastated by the war. Every indication points to a heavy trade in lumber during the present season, as the European demand for this material will be most difficult to supply. It is fully expected that from now on the bulk of returning Canadian soldiers, and probably many Americans, will be landed in Montreal. Provision is being made in shed No. 16 to accommodate returned men and their returning families, coming home on the ordinary passenger steamers. Plans are virtually completed, and every facility is being provided, including rest rooms, special accommodation for sick travellers, dining rooms, baths and also beds will be furnished; likewise arrangements whereby arrivals can entrain direct from the boats and thence be transferred to the road that will carry them direct to their destination. It is believed that the port of Montreal will be second to none in Canada for expeditious operation and for convenience to the travelling public.

The first vessel up the river to dock at thewharf was the War Redcap, one of the boats built for the British Ministry of Shipping. She arrived here from New York and has been consigned to the White Star-Dominion Line. The first transatlantic vessel, however, has not yet reported.

Owing to the losses that have been suffered by the different shipping companies, it is difficult to state the tonnage that will be available, but many new vessels will arrive this season that have not been seen here previously. A feature that adds to the difficulties of shipping companies is the fact that cargo space is not yet entirely freed, as certain control is still exercised over them by the British Government, in some instances as high as 70 per cent. being required for Government space.

The Canadian National Steamship Company's steamer the Canadian Pioneer, is preparing for her maiden voyage. She has been lying at the Louise docks at Quebec since her removal from the Vickers plant in Montreal, where she was built last Fall. On the 21st she left her dock and proceeded up the St. Charles River to take on coal, prior to her trip to Montreal for final inspection and the taking on of cargo for overseas.

From Montreal to the sea and all along the canal activity is becoming more pronounced daily. If present plans, now under consideration by the Montreal Harbor Commissioners, are carried out, this year will see the commencement of extensive improvements that were necessarily deferred during recent years, owing to the more urgent requirements contingent to war conditions. The electrification of the entire railroad system along the water front was part of the original plan of improvements involving an expenditure of about $15,000,000, but war requirements resulted in the temporary shelving of the plan. The completed scheme will include the developments on the South Shore as well as those on the existing harbor frontage on the island. Bridging the river by way of St. Helen's Island is likewise part of the proposed programme, and associated with it is the connecting of the harbor system with the Canadian National Railway terminal on Lagauchetiere Street.

During the first half of April the water was drained from the Lachine Canal to enable the annual inspection and necessary repairs to be carried out. A little over two weeks was taken for this work, much of which had to be hurried owing to the early opening of the shipping season. It is expected that during the coming month a large fleet of boats, built on the Great Lakes by the American Shipping Board, will come down the canal on their way to their destination.

The launch of the "Canadian Ranger" from the yard of the Canadian Vickers Limited, on the afternoon of the 19th of April, marked the opening of the external activities of the firm. This is the third of the Government steamers to leave this yard, and the fifth of the fleet, two having been launched from Pacific Coast shipyards. Officials of Vickers anticipate the launching of three others within the next 45 days. A detailed announcement of this most recent launch appears in another section of this paper.

Rapid progress is being made on the eight wooden vessels under construction by the Fraser, Brace Co. for the French Government. Early in March the basin was flooded and the three being built therein were floated and transferred to the canal. Some little difficulty was experienced with the ice in the canal but this was soon overcome and the vessels located alongside the bank for outfitting. These three are nearing completion, and the first will be ready for delivery by about the first of May. Work on the others is proceeding favorably, and it is expected that the two now in the basin will be floated about the middle of the month, and those on the banks will be launched early in June.

BRITISH COLUMBIA NEWS

NOW that tonnage is being returned to the pre-war trade routes on the Pacific, and the abnormal shipping conditions caused by four years of war are gradually disappearing, an interesting race between the Canadian and Japanese shipping companies is looked for as a certain development.

The commandeering of the Canadian Pacific Ocean Service's largest and fastest ships made it possible for the Japanese concerns to secure a strong foothold in transpacific trade, and there is every indication that the Japanese will not give up what they hold without making a strenuous effort to retain their war-time advantage.

The C.P.O.S. has all its big cargo and passenger carriers back on the Pacific now—the Empress of Russia, Empress of Asia, Empress of Japan, Monteagle, and also a new vessel, the Methven, a 4,500-tonner. The Canadian company is also building in the Fairfield yards a steamship even larger and faster than the Empress liners, which have gained the name "Greyhounds of the Pacific."

A significant announcement has been made by the Nippon Yusen Kaisha, Japan's premier shipping company, to the effect that six mammoth passenger liners, each of over 20,000 tons, and with a speed of twenty knots, are now in course of construction at Kobe and Nagasaki, and on completion will be placed in service by the company for the Yokohama-Victoria-Seattle run.

Evidently, the Japanese are not only determined to provide the C.P.O.S. with strong competition, but are confident of the future of Pacific oversea commerce at a time when considerable uncertainty is entertained in some quarters. The writer has received within the past few days information from the Philippines to the effect that ships have recently been forced to leave Manila in ballast, but this represents a condition that cannot last very long. On the contrary, the feeling is general that the countries bordering on the Pacific are likely to experience a period of unprecedented shipping and trading activity. Shipping out of Japan just now is not very active, however, and reports state that dozens of ocean-going vessels are tied up in port with nowhere to go. It therefore appears as though the Nippon Yusen Kaisha, in building the six new liners, is not figuring so much on the immediate prospects, but is looking farther ahead to the period when the trade of the world will once more settle down to a normal state.

The Imperial Munitions Board, having

completed its programme on the Pacific paring to close its offices here. The director, Mr. R. P. Butchart, has returned to his private business, and Capt. John Snoddon, representative of the British Ministry of Shipping, and the interests to whom the vessels are being delivered, will leave shortly for London. The War Suquash is the last vessel of the fleet to leave for European waters.

The contractors for the hulls on this coast were: The Foundation Company, Ltd., Victoria, five ships; Cameron-Genoa Mills Shipbuilders, Ltd., Victoria, four ships; Western Canada Shipyards, Ltd., Vancouver, six ships; Lyall Shipbuilding Co., North Vancouver, six ships; New Westminster Construction & Engineering Co., New Westminster, four ships; and the Pacific Construction Co., Port Coquitlam, two ships. The names of the vessels built and the order of launching follow: War Songhee, War Nootka, War Yukon, War Selkirk, War Caribou, War Comox, War Masset, War Tyee, War Haida, War Cayuse, War Atlin, War Tatla, War Skeena, War Edensaw, War Babine, War Nicola, War Casco, War Sumas, War Suquash, War Chilkat, War Stikine, War Tanoo, War Kitimaat, War Camsin, War Nanoose, War Ewen.

The B. C.-built ships were consigned to the following British shipping firms: Easton, Greig & Co., Glasgow; J. Cook & Sons, Aberdeen; H. Fernie & Sons, Liverpool; J. Hardie & Co., Glasgow, and R. and J. H. Rea & Co., London.

Word has been received here that the Luckenbach and the American Hawaiian Lines will shortly resume their service between Atlantic and Pacific ports. The first Luckenbach steamer is scheduled to reach these waters in October.

The British Columbia Salvage Company is planning an important expansion that will make it the pre-eminent salvage concern on the Pacific Coast. Headquarters of the company will continue to be at Victoria, and Mr. Arthur C. Burdick will be managing director. The company has purchased the former sloop-of-war Algerine and will equip the vessel for salvage work. The Algerine was built in 1895, has a gross tonnage of 1,050, and also an interesting history. Before being transferred to Esquimalt some ten years ago, the Algerine was operated at the China station and patrolled the Chinese and Behring Sea for a considerable period. At the outbreak of war she narrowly escaped capture by the German cruiser Leipzig.

The two steel steamships of 8,100 tons that the Harbor & Marine Company, Ltd., has agreed to build in Victoria will cost the Dominion Government $1,603,-800 apiece, $198 being the price fixed per ton. The yards are rapidly being laid out, and they will be operated on the open shop plan.

The Consolidated Whaling Company will have all its steamers at sea in a few days. The Elihu Thompson was the first vessel to clear for the Akutan whaling station in the Aleutian Islands, and the remainder of the fleet will be given orders to set out for the hunting grounds later in the month. The catch last year smashed all records, 999 whales being killed during the season. The company plans to equal, if not surpass, this record during the coming summer. The following vessels compose the fleet: William Grant, Orion, St. Lawrence, Black, White, Brown, Green, Blue, Kodiak, Unimak, Tanganak, and Patterson. The vessels have been thoroughly overhauled and will probably be equally divided among the stations at Akutan, Kyuquot, Rose Harbor and Naden Harbor.

The assembling plant of the Foundation Company at Ogden Point was tied up for two days during the latter part of March, when immigration officials threatened to deport four heads of the company's departments on account of their being American citizens and therefore affected by the Dominion Order-in-Council prohibiting entry into Canada of skilled labor. The trouble blew over, however, and it was claimed that the matter was due to misunderstanding. The departments are managed by the same men as before.

Victoria's first attempt at a double launching was marred on March 28, when the steamship Strasbourg, built by the Foundation Company for the French Government, refused to slide down the ways. Her sister ship, the Metz, however, was sent into the water without difficulty and the Strasbourg followed the next day. Lady Barnard, wife of Sir Francis Barnard, Lieutenant-Governor of British Columbia, was sponsor for the Strasbourg, while Mrs. Oliver, wife of Premier John Oliver, christened the Metz. The third vessel to be launched by the Foundation Company, the Mulhouse, was launched April 10.

The big liner Empress of Russia, of the Canadian Pacific Ocean Services, Ltd., returned to these waters recently to resume the transpacific service. She was commandeered ten months ago, and while under Admiralty orders made five trips across the Atlantic with American troops, carrying 16,000 of them altogether. On her return voyage to the Pacific, she carried about 3,000 Chinese coolies from Marseilles to Tsing-tao via the Suez Canal.

Mr. Alex. Johnston, deputy minister of Marine and Fisheries, was a recent visitor to Victoria, and while here made arrangements for the erection of a new administration building for the department on the industrial area, which was formerly occupied by the Songhees Indian reserve. Mr. Johnston states that the steam trawlers Givenchy, Armentieres and Thiepval, which are now on their way to this coast from the Atlantic by way of the Panama Canal, under escort of the patrol ship Stadacona, are to be controlled here by the Naval Department and not by the Department of Marine and Fisheries, as had been intimated.

Mr. H. B. Davenport, for several years the local representative of Dodwell & Company, agents for the Holt (Blue Funnel) Steamship Line, has been transferred to the company's office in Seattle and has been succeeded here by Mr. Duncan Cameron, formerly of the Vancouver office, and who for twelve years was in the service of the Canadian Pacific Railway. The Blue Funnel liners are gradually getting back to normal schedule. The first vessel to resume regular sailings was the Euryalus, formerly known as the Indrakuala, of the Indra Line.

As a result of labor troubles, the Pacific Steamship Company (Admiral Line) had to cancel the repair contract with that firm in respect to the steamer Admiral Watson, which recently broke its crankshaft off the Queen Charlotte Islands. The Admiral Watson arrived at Seattle when the big shipyard strike there was at its height and when it was sent to Yarrows' at Esquimalt the workmen refused to do the job, classing it as "unfair." Then Victoria and Esquimalt had a strike all their own as a result of the employers declining to pay the whole of the Macdonald wage adjustment award, and the Admiral Watson steamed back to Seattle. The strike lasted ten days, and ended when the employers decided to pay the award. Since then, another award, reducing shipyard wages 2 cents an hour, has gone into effect.

Restrictions Removed.—Advices have been received by G. T. Milne, Montreal, and F. W. Field, Toronto, British Trade Commissioners in Canada, that the following additions have been made to the list of goods which may be exported without license: Fancy goods made of morocco and light leathers; iron and steel manufactures generally except high speed steel and certain special articles; machinery of all kinds except textile machinery and machinery wholly made of brass or copper; toys and dolls; games of all kinds. Lists of export restrictions recently removed: Binder twine, barrels and casks, boilers, chrome ore, chestnut extract cork, fuel economizers for boilers, goldbeaters' skin, glue stock, dry white lead, hide clippings resins, lead coated sheets, paraffin, wax, pigskins, cast iron pipes, or steel wire, wire rope, quebracho extract, cast iron radiators, solid glucose, railway sleepers of iron or steel, railway springs, railway wheels, axles and tires, railway constructional material except rails, silk manufactures, spirits except whiskey, terneplates, tinplates. Important prohibition relaxed: Bacon, lard, hams, hardwood, the latter until January 1st. Important relaxations revoked, licenses will be now necessary for brooms, brushes, buttons, gloves of leather and fabric, gas mantles, vegetable, tape, cotton piece goods.

THE ELECTRIC PROPULSION OF SHIPS

By W. L. R. EMMET

THE possibility of propelling ships by electric motors has for a long time been considered, but it was only after the turbine-generator had attained a high state of development in the matters of efficiency and likeness that any justification for electric propulsion began to appear.

The first plans for electric propulsion contemplated by the writer were formed soon after these conditions had developed in turbine construction, and some time in advance of any serious proposal to apply mechanical gearing to the same purpose. The introduction of the turbine had by this time completely changed and greatly reduced the cost of power development from fuel on shore, and it was obvious that any method which would make these improvements applicable to ships would have a very high value. Fuel economy is relatively much more important on ships than it is in most power developments on shore. Ships must not only purchase their fuel but they must carry it; and they will often be compelled to purchase it at points where the cost is very high.

The first proposal made for electric ship propulsion related to large warships for the simple reason that in such ships this method affords its greatest advantages, and that in the introduction of a new method it is always wise to select the application which affords the largest gain and advantage.

The most important advantages afforded by electric propulsion in a large warship are that it introduces the feature of interchangeability by which the ship can quickly put into operation after a portion of the apparatus has been damaged, and that it furnishes a means by which the ratio of speed reduction between the propellers and turbines can be changed; thus cruising speeds can be handled by a part of the apparatus without the sacrifice of efficiency which would be occasioned by a reduction of the turbine speed.

Other important advantages are that vital parts of the propelling machinery can be put into separate small compartments in those parts of the ship which are least subject to damage, and that no high-speed mechanisms or parts involving mechanical engagement are attached to the propeller shafts, thus the propeller shafts are free to revolve at all times whether they are being driven or not. No trouble which could occur in such electric motors would interfere with the freedom of their turning.

In electrically-driven ships the most advantageous speed of both turbine and propeller can be adopted, separate turbines for reversing can be dispensed with, and a high torque for reversing is readily obtainable.

The abandonment of the reversing turbine renders unnecessary the delivery of large flows of steam to turbine elements that are either standing still or moving in a reverse direction. Under certain conditions and in turbines of certain sizes, such reversing action may not be objectionable, but it involves the possibility of very high temperature and it is probable that these temperature variations have constituted a fruitful source of trouble in ship turbines. The use of very high superheat, which with electric drive constitutes a perfectly safe method of obtaining a high degree of fuel economy, will unquestionably involve danger in reversing operations with geared turbines, and these dangers are likely to be most serious in large units designed for high efficiency.

In ship propulsion through turbines and gears, it is desirable in all cases involving large power to use a plurality of turbines for each propeller; whereas with electric drive each propeller is driven by but one turbine or by a part of the power received from one. A subdivision of turbine units involves considerable loss and complication due to the multiplication in the number of packings, and also it involves a loss of pressure and liability to steam and air leakage in the cross-connections between different units.

While the simple operation of transmitting power through gearing is more efficient than its electrical transmission through generators and motors, the difference in large units is much less than has been generally supposed; and it is in a great measure compensated for by the friction load occasioned by the reversing turbines and by the disadvantages incident to the use of a plurality of turbines instead of one. If, in the interest of the gear proposition, anything is sacrificed in turbine speed or design or in the degree of superheat adopted, the electric drive will show an advantage even under the conditions for which the geared turbine is best adapted.

While much good service has been performed by geared-turbine equipments in ships, experience has shown that their success is dependent upon great accuracy of manufacture, that they are subject to injury through vibrations in the ship's structure or through wear in bearings or insecurity of mountings. Electric propulsion involves no motion other than simple rotation and this gives a maximum of mechanical simplicity.

LAUNCH OF THE "CANADIAN RANGER"

The fact that Canada's leading shipbuilding plant is located at Montreal, has naturally resulted in the people of this city feeling keenly interested in the forthcoming debate in Parliament in regard to the Government's shipbuilding program. The general opinion in circles where the experts foregather is that Canada can and should and must build ships.

It is argued that she can build them profitably; that she should build them to foster the new industry in which millions of dollars of capital and around 25,000 workers are interested; and that she must build ships to hold her place as a great manufacturing and agricultural country, with a huge surplus to export every year.

It is not generally realized that something like four-fifths of the shipping using Canadian ports is owned outside of this country, and built outside of it. That means that the money spent in building them and the money they earn after they are built all goes out of Canada.

As to the argument of cheaper production, that is entirely exploded, when the question of the operation of the ships and the retention of the earnings in this country is taken into consideration. It is reported that it is not possible to place a contract in any British yard for delivery during 1919.

The steel cargo steamer "Canadian Ranger," was successfully launched by the Canadian Vickers Company at Montreal on Saturday.

This is the fifth vessel to be launched in connection with the Government's shipbuilding program, and three of those have come from the Vickers yards. The "Canadian Ranger" was constructed during the winter, and every effort has been concentrated on having her ready for launching as soon as the ice cleared. She has been built under the special survey to meet the requirements of the British Lloyds 100-A1 classification certificate.

The ceremony of launching was performed by Mrs. Orr-Lewis, the wife of the president of the company, who has recently returned from England. A few prominent Montrealers were present, including shipping men, harbor authorities, and the company's principal officials.

The "Canadian Ranger" has a cargo-carrying capacity of around 8,100 deadweight tons; length overall, 400 feet; breadth moulded, 52 feet; depth moulded, 31 feet; with 3,000 I.H.P. She will have a speed of 11 knots at sea.

Among those present were Mr. and Mrs F. Orr Lewis, Hon. Mr. and Mrs. Baliantyne, Rev. and Mrs. R. L. Ballantyne, Mr. and Mrs. W. J. Lewis, Hon. Smeaton White, Lt.-Col. Peers Davidson, Sir Chas. Davidson, Hon. J. P. B. and Miss Casgrain, Arthur Plant, ex-M.L.A., Dr. Gaston Maillet, Mr. and Mrs. W. S. Walker, Mr. Farquhar Robertson, Mr. Justice and Mrs. Greenshields, the Misses Lewis, Lieut.-Col. Geo. R. Stark, Mr. S. W. Ewing, Mr. Mr. S. H. Ewing, Captain, Mrs. and Miss Begaud, Paris, Mr. H. Driver, Mr. and Mrs. H. Williams, Mr. and Mrs. H. M. Cameron, D. M. Campbell, Mr. and Mrs. P. H. Barclay, Mr. and Mrs. F. H. Man-



LAUNCHING THE "GENERAL TURNER."

and Mrs. F. W. Cowie, Brig.-Gen. and Mrs. C. A. Smart, and R. Silver, president of the Halifax Board of Trade.

LAUNCH ATTENDED WITH UNUSUAL CEREMONY

THE launch of the "General Turner" from the yard of the Dominion Shipbuilding Co., this month was attended with some special features. This is the fifth vessel to take the water within the last six months from this yard. There are three more vessels on the stocks, while the "General Currie" is lying at the wharf, about ready for sea.

The "General Turner" is of the same size and type as her predecessors, that is 261 feet overall, 43 feet 6 inches moulded breadth, and 24 feet 2 inches deep, with a deadweight capacity of 3,550 tons. She is equipped with triple expansion engines of 1,200 horse power, steam being supplied by two boilers of the Scotch marine type, at a working pressure of 180 lbs. per square inch.

The ceremony of christening was performed by Mrs. A. J. Brown. Mr. Brown is the Illustrious Potentate of Rameses Temple, Mystic Shrine, and the members of the Temple, with their band, attended in full regalia.

A parade was formed from the King Edward Hotel, to the shipyard, which was reached shortly before four o'clock. The sponsor and her escort then mounted the platform, and took their places. By this time all the wedging up was completed, and nothing remained but to chop out the blocks under the forefoot and sternpost. This done, the word was given, the shores cut away, and the ship slid down the ways without a hitch.

A COMPACT LIGHTING PLANT FOR TUG BOATS

A little electric lighting turbo-generator, that can literally be put out of the way on a shelf, is now being installed in a number of tug boats and other small harbor, river and coast vessels.

The set illustrated was built by the Westinghouse Electric & Manufacturing Co., and is in use on a U. S. Government tug boat. It is of 7½ kilowatt capacity, generates direct current at 250 volts, and and has sufficient power to provide current for all the 14 or so lamps needed on board and for the searchlight as well.

It consists of an impulse-type steam turbine and an electric generator, combined to form a single, compact unit. It is easily installed, for all that is necessary is to bolt it to a light foundation, attach the steam and exhaust pipes, and connect the leads to the electric wiring system.

The turbine consists of a single impulse wheel. It takes steam of from 70 to 225 lbs. directly from the boiler without a reducing valve, and can be operated either condensing or non-condensing. The exhaust steam is free from oil and can be used for heating purpoces. The speed is 4,000 r.p.m. and an automatic governor prevents over speeding.

The generator is directly connected to the turbine and is a specially designed, high-speed machine. It is arranged so that inspection and repairs can be made with ease.

The set has only two bearings, both of the ball type. All parts are readily accessible and very little attention is required during operation.

Can Take Action.—Formal permission was received from Official Referee J. A. C. Cameron by J. M. Bullen, acting for the Toronto Harbor Commissioners and for B. Heinstein & Sons, of Christiansand, authorizing him to proceed in actions against the Polson Iron Works to recover extensive damages. The Harbor Commission sue to recover possession of part of Frederick street and water lots which the Polson Iron Works allege they hold, not on the sufferance of the Commissioners, but pursuant to an agreement for a lease with the city. They also ask $60,000 for mesne profits and for use and occupation. Heinstein & Sons sue for the return of $41,500 which they allege they overpaid for the steamer Asp, built by the Polson Iron Works. They also ask for $200 a day from August 11, 1917, upon which rate the boat was to have been completed, but was not completed until October last. The damages claimed by them total $74,600.

Action Decided.—The Montreal Cotton and Wool Waste Company has been awarded judgment to the amount of $17,-167 against the Dominion Iron and Wrecking Co. The action arose over the refusal of the defendant to pay the purchase money required to buy the material in a bridge at Grand 'Mere.



MRS. BROWN AND GROUP OF SHRINERS.

Steel Castings Used in Ship Construction

Being a Detailed Description of the Pattern Making, Molding and Pouring of Steel Castings to Replace Forgings in the Construction of Ships in Great Britain Applicable to Canada

By BEN SHAW and JAMES EDGAR

In "Foundry Trade Journal," London, Eng.

THE number of steel foundries in Great Britain that could cope with very large work was comparatively small at the beginning of the war, but it was probably sufficient for normal needs. As the necessity, however, for more ships has become imperative, the larger foundries have become congested with work, and small foundries have had to adapt themselves to a class of work not only differing in size but also in design from that to which they were accustomed. Steel is probably the most uncertain of the common metals to cast, and the construction of the necessary patterns and the subsequent molding differ so much in large and small work, that successful results can only be obtained after considerable experience, or by the exercise of an unusual degree of initiative. The writers know of one small jobbing foundry which has had many defective castings, and consequently has lost heavily; yet the plant is modern, and there is no reason, apart from the human factor, for the non-success.

In all molding, but especially in molding for steel, it is little things that count. Unequal cooling, to mention one thing, has to be more guarded against than with other metals.

Occasionally the patterns for large steel work are conveyed by rail from the shipyard to the foundry if at a distance, but considerable delay is caused by this in addition to the danger of their being damaged in transit; consequently it is very common for the foundry to undertake the pattern-making. The necessity for accuracy in regard to the thickness of the metal in this class of work is not great, but angles are important. The patterns are difficult to handle because of their size, and as well as the pattern-maker having thorough confidence in his own judgment, he must also possess the ability to so build the work as to obtain the maximum of strength. This is even more essential with this class of work than with large engine work, because the designs are such that if the finished work yields, it is practically impossible to get it correct again. Although the metal is usually heavy, yet they are really delicate patterns. A level floor in the pattern shop is indispensable for this class of work, but this is easily made, and if the shop is too small, the work can be constructed in a convenient part of the foundry.

The case of many foundries is, that while they have a furnace, or cupola and converter, of sufficient capacity, they have made a specialty of small work; but there is no reason why such foundries should not undertake successfully large work, including the necessary patternmaking. In this connection there is less difference between iron and steel than there is between iron and non-ferrous metals, and the average iron foundry can adapt itself to brasswork. Large iron foundries have practically all the plant necessary for steel work except a converter, and with a few experienced steel molders ought to be able to cope with any steel work, however large. It is essential, of course, that a part of the foundry should be reserved for steel work.

It is very improbable that the foundry that increases its plant so as to cope with large work will have to revert to a small class of work after the war. Steel founding is still an immature industry. Before the war a great proportion of steel castings came from Germany and Sweden, but this is not likely to happen again. Steel is gradually displacing, not only iron but steel forgings, and there are indications that in the near future all turbine engine work, to mention only one class of castings, will be made in steel. The advantages are obvious. Apart from the additional strength, there is a great reduction in weight, which is of paramount consideration.

With regard to the relative merits of forgings and castings, it may be truly affirmed that each has positive advantages over the other, and there is continual disputing by experts as to which is the better. The balance of opinion now, however, is in favor of castings. Castings are generally cheaper, unless the design is very complicated, and this is true even when the patternmaking costs are heavy. The risk, however, is greater, because even with the greatest care, bad castings do occur, causing delay in delivery, and this occasionally influences shipbuilders in favor of forgings. There is also an element of uncertainty with castings, as there are occasionally internal defects not noticeable on the face of the casting, but this danger can be almost entirely eliminated if care be taken in cooling. Also, it is a mistake to suppose that forgings are not subject to internal strains; and welded joints on large work are not very reliable. Oftentimes, also, forgings are very expensive, because of the amount of machining that has to be done. There is a class of work that does not permit of an alternative method, and because of its design castings are necessary. In-

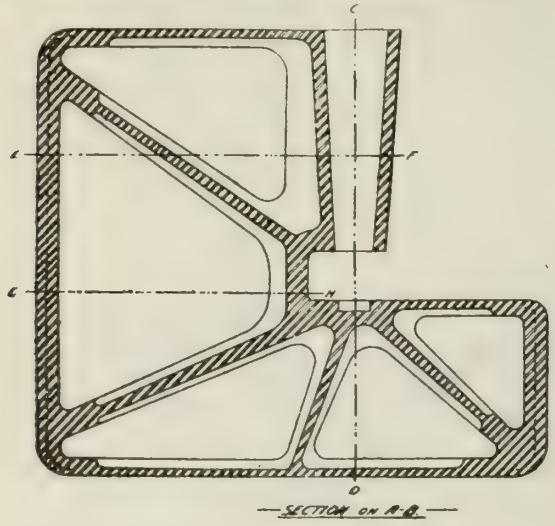


FIG. 1.

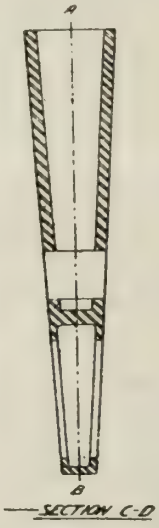
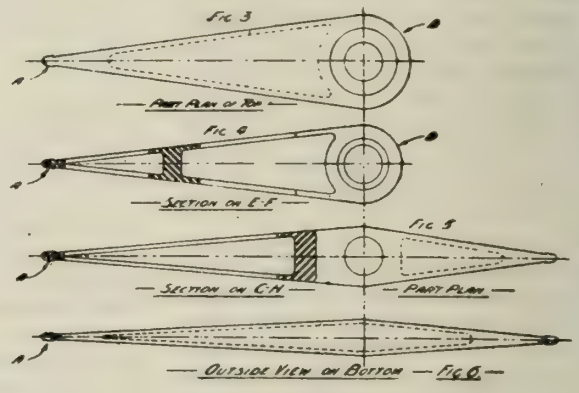


FIG. 2.



FIGS. 3 TO 6.

deed, the method of casting gives far greater scope to the designer. It is often possible to lighten the metal by coring, and to give a piece of work a more graceful shape if it is cast; an example of this is the propeller bracket, the "fish-back" or arm of which is frequently hollowed out.

A very large treatise might be written on large steel casting, but in the following articles the commoner types and representative designs have been chosen, and where two methods are possible, they have been explained.

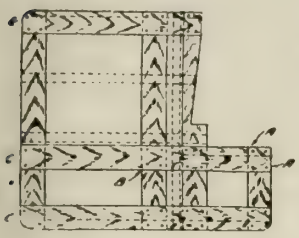


FIG. 7

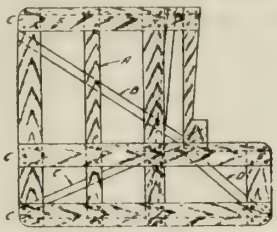


FIG. 8.

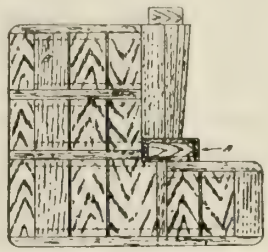


FIG. 9.

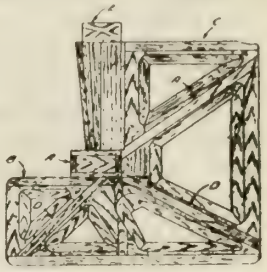


FIG. 10.

RUDDER

Making the Pattern

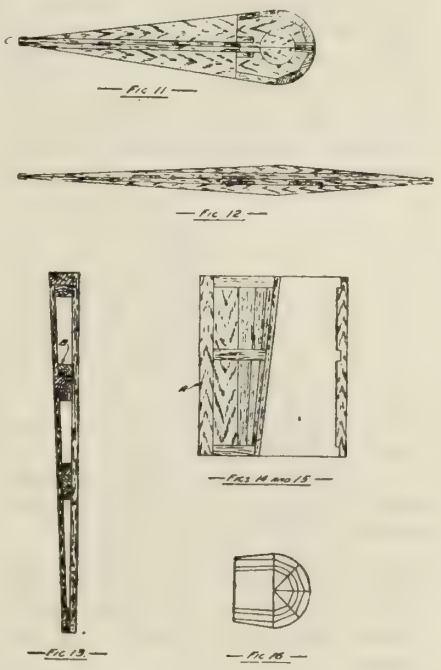
A representative type of rudder is shown in Figs. 1 to 6. The outlines of rudders vary somewhat, but the main features of their design are the same and the methods adopted in making the rudders shown are equally applicable to almost any rudder.

A glance at Figs. 1 and 2, bearing in mind that the height A B may be 12 or 14 ft., will give an idea of the fragility of the pattern, and the care which must be exercised in building it, to ensure that it will not break or twist. There are two ways in which the pattern may be made, and that adopted must depend on the foundry which is going to cast the work.

In some districts it is the practice to make all large patterns for steel exact models of the finished casting, unless for circular cores, in which case the molder makes his cores in place. The great advantage of this is, especially when dealing with awkward shapes, that the correct thickness of metal is assured, and another gain is that the molder sees his work more clearly, and can mark his course at the beginning of the job with greater confidence. It is, however, a slow method. If a block pattern is made, and the cores are made in separate boxes, the work can be better distributed. The latter method is, however, the more expensive in the pattern shop, although the foundry is of course the first consideration.

We shall consider making a block pattern first, although the initial step is the same whichever method is adopted—the work must be set down. The common practice is for the molding loft to supply the patternshop with a template. A drawing is provided, but for the main sizes, the template is more reliable, as it is frequently found necessary, when the frames are set out on the molding-loft floor, to change the design in places. It is not necessary, however, nor is it advisable, to set the work out on a drawing board. The drawing should be done on the floor, and on the top of this drawing the work is built. The simplest way is to screw the template to the floor, and mark a line round it. The template is, of course, the finished shape of the rudder, and the pattern-maker has to allow for contraction. The easiest way to do this is to draw the centre line C D, Fig. 1, and to measure all sizes at right angles to this line with a standard rule, and then transfer the size to the contraction rule. The sizes in the other direction, that is, in the height of the rudder can be measured from a base line. The section C D, Fig. 2, may be set down alongside the front elevation, but it is as well to put the other sections, Figs. 3, 4, 5, 6, on the top of the elevation. In painting the drawing, and it is necessary to do so, as it would otherwise become faint before the job is finished, the sections can be colored differently to the main view.

For the purpose of this article we shall suppose that the whole job is being made by one or two men, although in the average shop quite a few men would be employed on it. The joint frames should



be made first. It ought to be explained, however, that there is a considerable difference between the top and bottom halves. The prints are only put on the bottom half as they are unnecessary on the top half, apart from the danger of crushing when the cope is being lowered. A glance at Figs. 9 and 10 will show the reader the main differences. Fig. 9, which is the top, is covered all over, as it is easier for the pattern-maker to cover it with plates than for the molder to fill it with loam, but the bottom, on the other hand, does not need to be covered, it being sufficient to get bearing for the prints. The difference in construction begins with the joint frames. An extra piece A, Fig. 8, is half lapped on the frames to support the ribs B, C and D. A similar piece could be put in the other frame, but it is not so necessary as this half when contracted has greater strength. These frames should not be of less thickness than 1⅝ in., thus allowing 1½-in. screws to be used, and when the joints are cut there is a sufficient thickness to ensure rigidity. Care should be taken that the half laps are not too tight. It is rather peculiar that craftsmen who are careful to leave open joints when joining timber edge to edge will persist in making close half laps. Joints on the outside of a frame like A A, Fig. 7, may be close to preserve the correct shape of the frame, but all other joints like B, Fig. 7, where the side grain is enclosed on both sides, should be left 1-16th in. or ⅛ in. open, according to the width of the rails. If this is not done, when the pattern goes into the damp sand the wood will swell, and the frame will warp and alter the shape of the whole job. The frames, when the work is finally shaped off, will be reduced considerably as C, Fig. 11, and the half laps at this end will have to be cut so that an equal joint will be left.

It is unwise, if not impossible to screw the joints C C C, Figs. 7 and 8, but it is not wise to rely upon glue only. The best job is obtained by using lead rivets. They are easily made, and as easily fixed. A piece of 3-16 in. or ¼ in. lead wire is procured, and cut to convenient lengths. When the holes are bored with a shell bit, a plate is placed under the frame, a rivet inserted and hammered down. It is an improvement to countersink the hole on the face of the frame. The lead rivets will either chisel or plane nicely. If lead wire is not handy, wooden pegs should be used. If ¼ in. holes are bored, and the pegs are made ¼ in. square and pointed, they will make a fairly strong job, but they cannot be compared with lead rivets.

The best way to make the boss B, Figs. 3 and 4, is to make grounds and screw staves on to them. Of course the inner side will be cored. An end view

Fig. 25, will have to be made on which the boss will sit. Because of the shape it is not advisable to make an open frame as it would not be as strong as a plate. The battens B ought to be let into the plate half the thickness, and if it can be obtained, hard wood such as baywood, teak, sycamore, or maple should be used. The boss for each half will, of course, be a semi-diameter less the thickness of this joint plate. After the boss is screwed to the plate it will be well to place it on the working drawing and build a frame against it to support the ribs that separate the cores. This is a delicate job. It will be readily seen that if the ribs were laid on the floor the full depth, it would be difficult to joint them so that when the pattern is lifted the whole work would be rigid. It is better to build two thicknesses of ¾ in. timber well jointed and screwed. Fig. 25 is a view showing the plate with the box removed, and the skeleton-like groundwork with the joint arranged so as to give the greatest possible strength.

Fig. 26 shows the finished pattern. It will be seen that the boss is carried right through to the outside, but it is really better to keep it back the thickness of the rib A, so that this rib will help to bind the framework better by crossing the plate, and being screwed to the face of the boss. As will be seen from Fig. 26, the ribs are jointed across each other over the bottom plate. The necessity for this is obvious, as it is the chief means of binding the boss portion of the pattern to the outer skeleton. It will be as well now to make up the square shape at the foot of the boss. Solid blocks should be carefully fitted in, glued and screwed. The top print has been left off to show the construction. The fillets C, which should also be carefully fitted, help to keep the ribs rigid. All that remains to be done is to make and screw into position the ribs D. If the work is in a great hurry it is possible to make the two halves at the same time and dowel them afterwards, but generally it is wiser to complete the construction of one half, although, of course, the pieces may all be finished at the same time before the other half is proceeded with. The completed portion can be turned over and the other half built on top of it. If the foundry is a considerable distance from the patternshop, it is wise to screw some edge bars across the pattern. The molder can remove them before he starts his work.

There are so many loose pieces of ribs on the platform that it will save a great deal of trouble when the pattern has to be screwed together again to mark them carefully. Some patternshops are content with lettering loose pieces, but the pressed letters soon rise and cannot be seen, and paint marks are also soon obliterated. A good chisel cut or a V-tool mark is easily seen and will remain distinct as long as the pattern can be used.

BOOK REVIEW

Graphical and Mechanical Computation, by Joseph Lipka, Ph.D., John Wiley and Sons, Inc., New York; the Renouf Publishing Co., Montreal. Price $4.00.

A book written as an aid in the solution of a large number of problems which the engineer, as well as the student of engineering, meets in his work. In the opening chapter the construction of scales is developed and leads to a discussion of the principles upon which the construction of various slide rules is based. The second chapter develops the principles of a network of scales, showing their application to the use of various kinds of co-ordinate paper and to the charting of equations in three variables. Engineers have recognized for a long time the value of graphical charts in the lessening of the labor of computation. Among the charts devised none are so rapidly constructed, nor so easily read as the charts of the alignment type. Chapters III, IV and V give a systematic development of the construction of alignment charts; the methods are illustrated by charts for a large number of formulae. It is the writer's hope, as expressed in his preface, which we quote, that the simple mathematical treatment employed in these chapters will serve to make the engineering profession more widely acquainted with this time and labor saving device. Many formulae in the engineering sciences are emperical, and the value of many investigations is enhanced by the discovery of laws connecting the results. Chapter VI is concerned with the fitting of equations to emperical data. Chapter VII considers the case where the data are periodic, as in alternating currents, sound waves, etc. Where emperical formulae cannot be fitted to experimental data, further computation can be made by interpolation, differentiation, and integration by the methods developed in the last two chapters. Numerous illustrative examples are worked throughout the text and exercises are given at the end of each chapter. While a preliminary knowledge of mathematics is essential to the complete understanding of the subject matter of this book, it places in the hands of the designing engineer a powerful means of simplifying the calculation of problems arising every day in structural, hydraulic, power plant, mechanical and electrical engineering. The treatment adopted throughout is concise and well arranged.

Electro-Metallurgy, Electrolytic and Electro-thermal Processes, By Eric K. Rideal, Bailliere, Tindall and Cox, London.

The rapid development of applied chemistry in recent years, accelerated by the recent war, has brought about a revolution in all branches of technology. A series of books, of which the present publication is one, is being prepared by the publishers as an aid to the further development of industrial chemistry throughout the British empire. This series will give a general survey of the particular portion of the science dealt with and each volume is complete in itself. The present volume is divided into eight main sections dealing with electrolysis in aqueous solutions; electrolysis in fused electrolytes; the electrolytic preparation of the rare metals; electro-thermal processes; carborundum and oxysilicides of carbon; the carbides; electro-thermal nitrogen fixation by metals and metallic compounds, and iron and the ferro-alloys.

In an introduction to the above sections the problems relating to the ample supply of power necessary for electro-metallurgical operations are dealt with and interesting figures relative to comparative costs of power production by present methods, hydro-electric, coal, gas and oil are given. In Great Britain, where waterpowers are scarce and coal plentiful, the cost of producing power by the latter would seem to be sufficiently low to warrant the establishing of electro-chemical plants using it as fuel. The metalliferous resources of the British Commonwealth are also dealt with in the introduction.

In the section devoted to electrolysis in aqueous solutions the winning and refining of copper is thoroughly taken up and special mention is also made of the use of colloid addition agents in electrolytic work. The other metals treated of in this section are zinc, cadmium, gold, silver, nickel, lead, antimony, bismuth, tin, cobalt and cobalt nickel alloys. In general this section may be said to be an exhaustive summary of present day practice.

In the section devoted to fused electrolytes, the preparation of sodium potassium, lead zinc, aluminum and other metals is dealt with. A portion of the book which is of considerable interest deals with the preparation of the rarer metals which are finding increasing application in modern industry. The section on electro-thermal processes deals with the smelting of and reducing of the metallic elements from their ores and also with the preparation of graphite and other electric furnace products.

Carborundum, carbides and the fixation of atmospheric nitrogen are also considered and an important part of the contents is related to the iron and steel industry.

As a reference aid to the metallurgist engineer or chemist interested in electro-metallurgy this publication should find considerable usefulness and the excellent bibliography which is incorporated at the end of each section is of considerable assistance to those wishing to make further investigation.

The value of the work is greatly enhanced by the incorporation of much material in the nature of calculations as to energy requirements for electrolytic and electro-thermal processes.

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

CONTINUOUS PHOTO-PRINTING MACHINE

THE illustrations show a continuous photo-printing machine, used in conjunction with an automatic washing and drying machine, both of which were designed and constructed by the C. F. Pease Company, of 213-231 Institute Place, Chicago, Illinois, U.S.A., and are sold under the trade name "Peerless." With these machines a

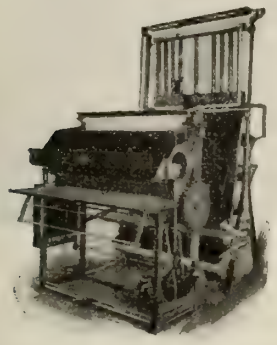


FIG. 1—FRONT VIEW OF BLUEPRINTING MACHINE.

single operator can print, wash and dry 100 linear yards of blue prints per hour, during which time the apparatus consumes 7 units of electrical energy, 60 gallons of water, and 50 cubic feet of gas. It is, of course, quite possible to use the machine for part of the time only if such a large output is not required. The operator's time can then be occupied in other ways, and the working costs correspondingly reduced. Prints can also be made on separate sheets of sensitized paper, instead of in continuous rolls, if desired. Fig. 1 is a front view of the machine, and Fig. 2 is a side view, showing the course of the paper through the apparatus. The table from which the tracings are fed into the machine will be seen in Fig. 1, and beneath it are two horizontal spindles which carry rolls of sentilized paper of different widths. The tracings and paper are carried upwards over a cylindrical segment of thick plateglass by means of an endless canvas belt, best seen in Fig. 2. Springs are provided to keep the belt tight, so as to ensure good contact, and side travel of the belt is prevented by a special device. The belt is driven by a small electric motor, the speed of which is controlled by a rheostat placed on the right-hand side of the machine; both motor and rheostat are clearly shown in Fig. 1. By means of the rheostat, the speed of the paper can be varied from 4 in. per minute, which allows sufficient exposure for the slowest negatives and black-line prints, up to 6 per minute.

The exposed paper can be examined immediately it has passed the glass segment, so that the speed can be adjusted to give the right exposure before any prints have been spoilt. In front of the glass is a bank of five arc-lamps, of the enclosed type, fitted with aluminum reflectors. Each lamp is separately wired and controlled by switches, which are enclosed in a metal box on the left-hand side of the machine, as shown in Fig. 2. The number of lamps employed can thus be varied according to the width of paper being used. The motor-switches are also enclosed in the same box, and all the wiring is encased in steel tubing. A small electric fan of the pedestal type is mounted on top of the switch box. This fan, which can be distinguished in Fig. 2, drives a current of air in a transverse direction through the machine, in order to carry away the heat from the lamps.

Fig. 3 shows how easily accessible the lamps are for trimming and cleaning, and also illustrates how they may be turned back to facilitate these operations.

After printing, the tracings are delivered into an enamelled iron trough in front of the machine, so that the operator can remove them without changing his position. This trough, which can be seen in Fig. 1, also serves to catch the exposed sensitive paper if the printing machine is used independently of the washing and drying equipment, as is often the case. Usually, however, the exposed paper passes over a roller at the top of the printing machine, and thence to the washing and drying machine, as shown in Fig. 2. This part of the apparatus is driven,

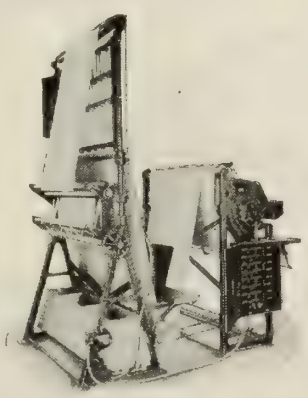


FIG. 2—SIDE VIEW OF MACHINE.

by means of chains and sprocket wheels, from the motor of the printing machine, and in it the paper is first washed by a spray of pure water, and afterwards treated by a weak solution of potassium bichromate. This solution is contained in a galvanized tank placed in the base of the machine, and clearly visible in Fig. 2.

From this tank the solution is circulated by a small rotary pump, driven by an electric motor, having a vertical shaft, and delivered on to the paper through a flexible pipe; an inspection of Fig. 2 will make the whole arrangement clear. After a further washing with pure water, the paper passes upwards in front of the drying device, over

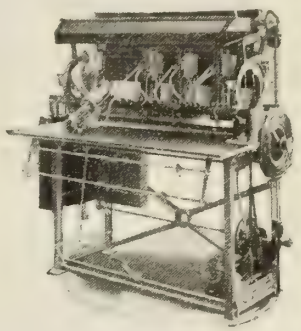


FIG. 3—REAR VIEW OF MACHINE SHOWING ACCESSIBILITY OF LAMPS.

a roller at the top, and down at the back of the machine. Here it passes through a system of rollers which carry a series of elastic bands, running in opposite directions, and forming part of a device for rolling up the finished prints. These are wound up on a shaft, but the end of the paper, as it decends from the roller at the top of the machine, is formed into a loose roll, and this roll of finished prints entirely free from wrinkles and distortion, being placed upon the bands, continues to roll itself up automatically until the operator wishes to cut off and start a new roll.

SCREWING MACHINE FOR BENT TUBES

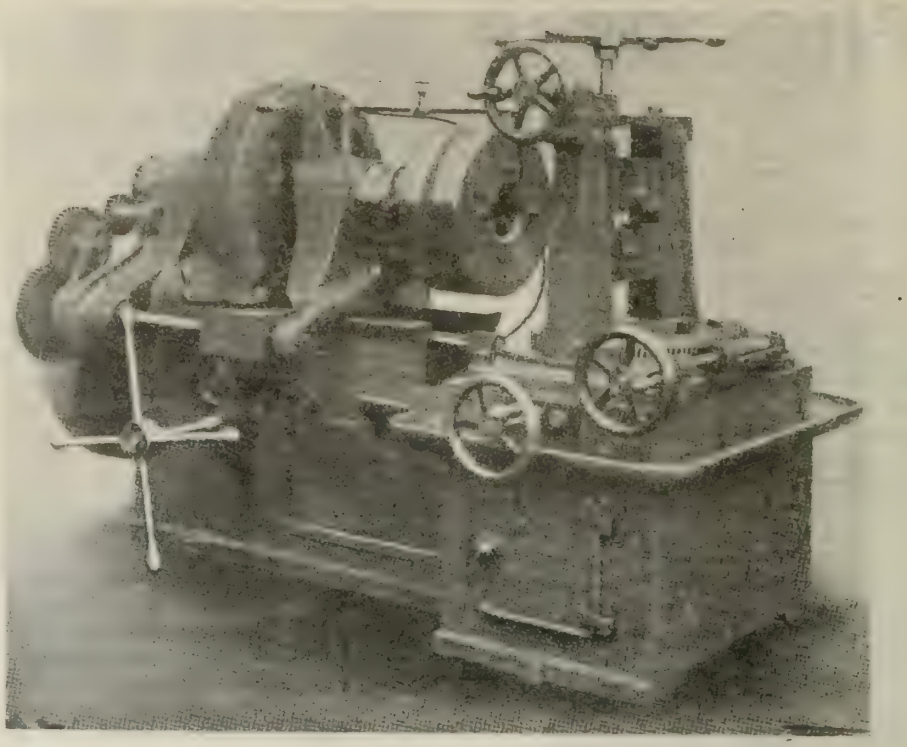
The screwing machine illustrated here, through courtesy of "Engineering" is made by Joshua Heap & Co., Limited, Ashton-Under-Lyne, Lancashire. It has been specially designed for screwing the thread on the long bent tubes by shipbuilders and in the equipment of power stations. The machine is made in four sizes covering a range of 4 to 10 inches. The novel feature is the device for gripping the tubes. This is designed to travel across the machine; it has a swivelling or rotary motion, and the grips, which are closed and opened by a right and left handed threaded screw, can be above or below the centre line of the screwing dies. By utilizing any or all of these movements it will readily be seen that bent tubes can be effectively held, and in the case of awkward

bends the tube may be actually gripped on the bend or elbow.

The machine is fitted with a lead screw in order that accurate threads may be cut on the tube.

The four inch and six inch machines are fitted with the maker's patent releasing motion, by which the dies are instantly opened upon the completion of the thread, thus allowing the tube to be withdrawn from the dies without stopping or reversing the machine. In the two larger sizes of machine this special device is not supplied as it is necessary to stop the machine.

The machines are of substantial construction; all the gears are machine cut and a pump is fitted for the automatic supply of oil for the cutting dies.



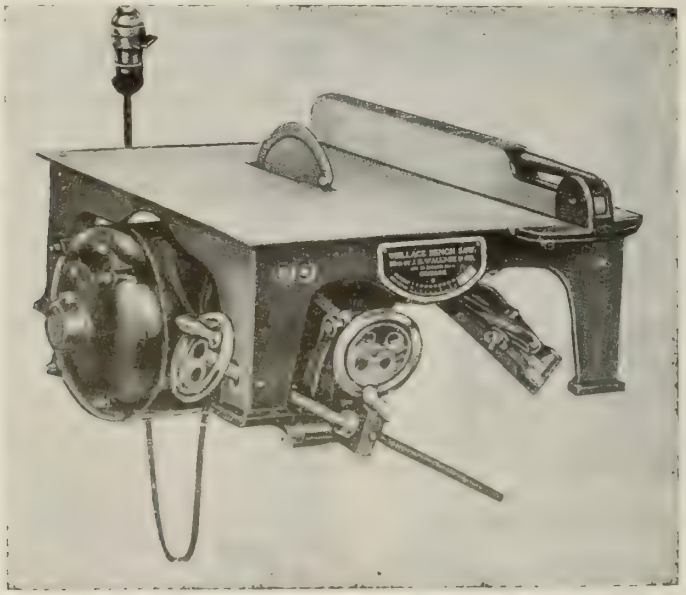
SCREWING MACHINE, FOR BENT TUBES.

NEW BENCH SAW

THE illustration shows a new bench saw recently developed by J. D. Wallace & Co., 1405 N. Jackson Boulevard, Chicago, This machine eliminates much of the waste of time occasioned by the running to and from stationary machines.

As the name implies the Wallace Bench Saw is a bench tool portable and designed to operate on the electric lighting current, yet it has ample power to take a full two-inch cut through the hardest of wood, making it possible to use this machine for 80 per cent. at least of the sawing usually done.

This machine overcomes the disadvantages of other designs. To cut at an angle the saw is tilted instead of cocking up a heavy table. The illustration shows the saw tilted to a 45 degree angle. This, as will be realized, makes it possible to cut long stock without fear of breaking the angle by the stock coming in contact with the floor, as is so often experienced when attempting to cut long stock on a table tilting machine.



NEW BENCH SAW

Other advantages accruing from this saw tilting design are, first: the operator is working on a table which is always in a horizontal, efficient and safe position; second: the exact angle of cut is set without much difficulty by simply spinning the hand wheel until the angle desired is registered on the dial in the front of the machine; third: no time is wasted adjusting the machine, for, as is often the experience when attempting to set a table tilting machine, the heavy table drops a few degrees before the screw is tightened, making it necessary to do the work over again, or if the drop goes unnoticed the cut is taken and the stock either spoiled or the job must be done over.

This tilting mechanism is controlled by a hand wheel mounted on a perfectly cut screw acting on a swiveled nut. This swings the cradle in which the motor-driving mechanism and saw are mounted. While it is very easy to make this adjustment, the screw holds the cradle rigidly.

The saw can be raised and lowered so as to cut or groove the stock any depth up to 2 inches. The raising and lowering mechanism is similar to the tilting mechanism and is controlled by a hand wheel in the front of the machine.

The crosscut fence is built into the machine but can be thown under the table when not in use. It is, however, never off of the machine and lost.

The rip fence is finished on both sides so that it can be used on either side of the saw. This fence is of box type and is clamped to both sides of the table by means of a handle conveniently located. This handle works on an eccentric and locks by going over the centre of the eccentric.

The shutter saw guard is a great factor in increasing the efficiency and cutting expenses with this saw. This saw guard is built into the machine, and for that reason is always on guard. It slips back as the stock goes through and is so designed that it never interferes with the efficient operation of the saw.

It not only protects the operator's hands, but prevents two other causes for accidents, which cause more losses than actual cutting, that of catching the tail end of the stock in the back of the saw or catching the waste stock in the teeth of the saw and having it shoot into the abdomen of the operator. The saw guard eliminates all three causes and for that reason saves time and damages.

TAPER ATTACHMENT FOR SUNSTRAND LATHE

The Rockford Tool Co., Harrison Ave., Rockford, Ill., have developed a taper attachment for use with their Sunstrand lathe. The lathe was recently described

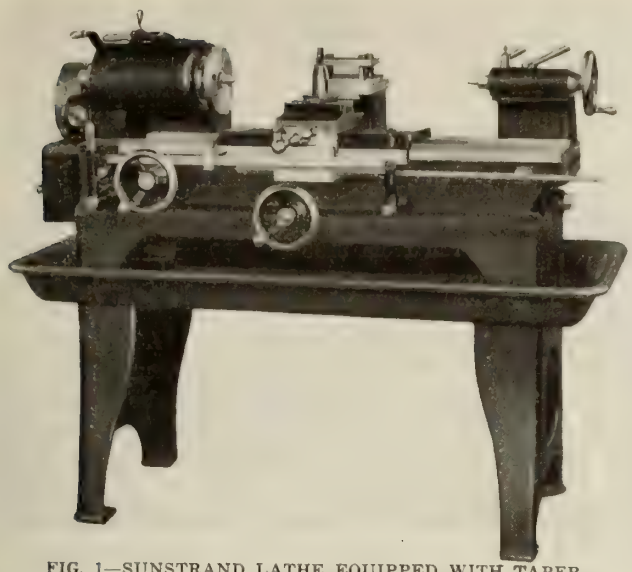
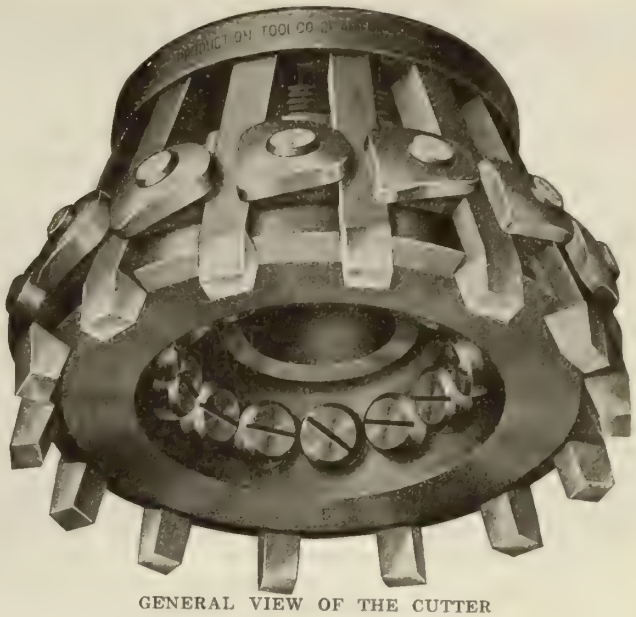


FIG. 1—SUNSTRAND LATHE EQUIPPED WITH TAPER



GENERAL VIEW OF THE CUTTER

in MARINE ENGINEERING and the taper attachment illustrated has some novel features of interest, chief among which is the fact that it is located on the front of the lathe instead of the rear, as is more usually the custom. Another important feature has to do with the method of attaching the taper device. Only three screws are necessary, and if the owner desires to buy the taper attachment for a lathe already in his shop, no fitting or machining are necessary to secure it in place. Too often these screws will be noticed on the block forming the front of the attachment, and the other is at the right hand end of the bed, where the bracket is attached. The attachment is made with graduations to indicate tapers in either degrees or in inches per foot, and is provided with a sliding block running in a bearing, which may be set at any desired angle.



FIG. 2—TOP VIEW OF TAPER ATTACHMENT

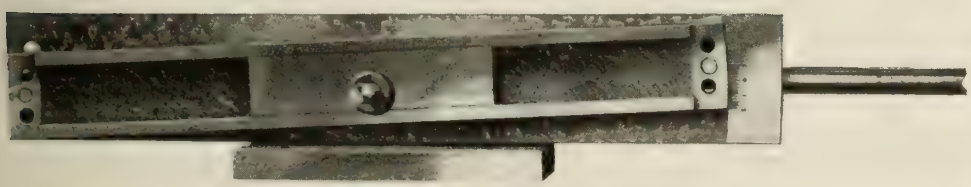
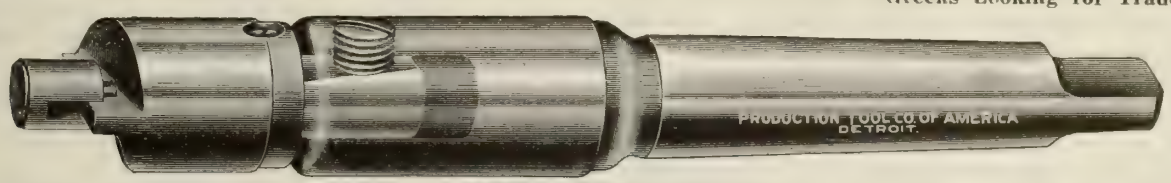


FIG. 3—SIDE VIEW OF TAPER ATTACHMENT

PRODUCTION SPOTFACERS

A cutter designed primarily for production spotfacing is illustrated herewith. It is made with two lips instead of four or six, which obviates the heavy breakage experienced with other types. These cutters are made of high speed steel, properly hardened and ground and manufactured in all sizes from ⅜ in. to 3 in. Pilots are standard in 64th in. sizes and holders are provided with either straight or Morse taper shanks. All parts are interchangeable. These spotfacers are especially adapted for machining irregular or sandy castings as teeth of cutter do not drag but remove scale in one revolution. Ease of grinding and long life are additional features of this Spotfacer which is made by the Production Tool Co. of America, Detroit, Mich.



GENERAL VIEW OF THE TOOL

"PRODUCTION" SURFACE MILLING CUTTERS

A Surface Milling Cutter designed to stand heavy feeds of high duty milling machines and to produce a finished surface with one cut has been designed by the Production Tool Company of America, Detroit, Mich.

Its free-cutting qualities and firmness of clamping methods enables the tool to give the same results on solid steel pads and thin or chilled castings.

Standard square bits of high speed steel are used and provision is made to allow for repeated adjustment for a new series of grinding before bits are finally short enough to be used on lathe or shaper tools.

Low first cost and long life are additional claims for this type of cutter. The construction of this cutter may be seen from the accompanying illustration.

VICTORIA.—The Harbor and Marine Co., Ltd., is being incorporated to build a plant for the construction of two 8,100 ton steamers for the Dominion Government. The head of the new firm will be C. J. V. Spratt, of the Victoria Machinery Depot, Ltd. The vessels will be commenced as soon as steel is received.

To Investigate Lumber.—The British timber controller, Sir James Bell, is coming to this country shortly to investigate the possibilities of the Dominion's timber. Sir James has been in frequent communication with Mr. Lloyd Harris, of the Canadian Trade Commission, on the question of importing timber from Canada.

Greeks Looking for Trade.—It is understood that a Greek commercial mission will shortly leave Athens for Canada. The object of the mission will be to determine to what extent Canadian industries can supply Greek requirements, and to arrange means for the placing of Greek orders in Canada.

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SHIPBUILDING COSTS

CHAIRMAN HURLEY, of the United States Shipping Board, made the interesting announcement recently that the Submarine Boat Company stand ready to build eight 12,000-ton deadweight steamers of the cargo class at $149 per ton.

This is a considerable decrease on the prices that have been ruling which ran from $195 to $250 per ton. The Submarine Boat operates on the fabricating system, and this, with the absence of high rates of pay for overtime has no doubt much to do with the reduction. At a launch from the Canadian Vickers the other day, mention was made of a ship under construction there for French owners, who placed the order in Canada owing to the better price obtained here over quotations from U. S. yards.

It will be interesting to see how the other plants in the United States will compare with the Submarine Boat on future contracts. This shipbuilding situation is likely to be of considerable interest for some time to come and will be watched carefully both in Canada and Great Britain.

DIVISION OF ENEMY TONNAGE

SOME dissatisfaction is being voiced by Old Country shipping papers anent the apportioning of enemy tonnage. This has been occasioned by the arrival in the Mersey of three large German steamers, manned and officered by United States crews. This, it is claimed, points to a slackness on the part of the British Ministry of Shipping, in view of the anxiety of British shipowners to get tonnage.

Some figures recently to hand substantiate the complaint. The United States losses were but 7.2 per cent. of her pre-war shipping, while her gains by new construction and seizure of enemy vessels has been 125 per cent. On the other hand, Great Britain suffered the loss of nearly 40 per cent. of her shipping, and her gains are only 18 per cent.

Much of the energies of the British yards had to be given over to the warship construction and repair during the war. At the same time her merchant ships were at the disposal of all the allied nations, and British shipowners let trade that had been years building up go adrift, while their ships were on Admiralty service.

The United States Government has avowed its intention of competing for a share of the world's carrying trade. With this no one can find fault, and in the natural course of events British shipowners can compete with any in the world. What the ultimate division of these enemy vessels will be cannot be determined till the labors of the peace conference are over. The only fair and reasonable division should be one ton of enemy vessel for one ton of allied shipping lost, and Great Britain, with her enormous losses, should be the first to receive compensation.

CANADA continues to import 95 per cent. of her iron ore, 98 per cent. of her crude oil, 50 per cent. of her coal, and large quantities of other raw materials which are available here. It is high time that we should, persistently and with good purpose, seek to make this country as self-contained and as industrially independent as possible.



The Canadian Merchant Service Guild Meeting

Held in Toronto February 19th—Election of Officers—Presentation of Gold Locket to Capt. Stitt—Address by Capt. R. D. Simpson—Secretary and Auditor's Report

OF the management committee, Capt. R. D. Simpson, chairman; Capt. W. Inkster, secretary; Capts. A. McIntyre, J. N. Foote, J. E. Mann, D. J. Stitt, R. H. Boyal, F. A. McMann, and 1st Officer J. K. Corson, were present.

Capts. R. McIntyre, W. B. Cunningham, R. Wilson, and 1st Officer W. McComb, were absent owing to sickness or professional duty.

Sarnia Division was represented by Capt. P. McIntyre, and Windsor by Capt. A. Baxter.

At 2 p.m. the above executive officers met in session.

The chairman gave a very suitable address. He hoped that those present would assist in carrying on the work before the chair in harmony amongst themselves. This would set an example of unity and good will to be fostered and maintained by all members of the institution throughout the whole Dominion of Canada.

The minutes of last session were adopted as read.

The auditors gave a satisfactory report and the secretary stated that after one year's work the institution was in first class financial condition, having a bank balance to carry over to 1919, and a copy of the audited statement would be sent to all present as soon as possible.

The chairman was unanimously re-elected for the year 1919.

The first order of new business was to elect officers. After some discussion it was considered advisable that the old Board remain in office during the year, and toward the end of navigation the secretary would request the members in each district to appoint a representative, the same to take office at their next annual meeting.

At 5 p.m. the session was adjourned till 10 a.m. the following morning and members were invited to a social gathering to be held that evening.

A large number of members and others attended and during the evening Capt. R. D. Simpson, chairman of the management committee, had the pleasure of presenting the ex-chairman, Capt. J. D. Stitt, of the Toronto Club, with a very fine gold locket, suitably engraved, in appreciation of his excellent work while holding that office.

Capt. J. D. Stitt sincerely thanked the members and asked that all do their utmost to enable the organization to accomplish the task they had set themselves, viz., to improve the conditions under which our seamen must carry on their profession, and so assist in building up the mercantile marine of Canada.

After the business of the club had been completed, Capt. Simpson was asked to address those present, which he did with great force and eloquence. He showed the need for organization amongst our seamen, warning them to navigate their own vessels, and not mix with labor unions. He had heard of an organization, incorporated with the labor unions of the United States, doing business amongst our seamen in the eastern parts of Ontario, and such amalgamation could only lead to the downfall of themselves and their profession.

To impress this more forcibly on those present, he asked them to take into consideration the position of a Canadian vessel going into an American port with members of such an organization on board. They might, on arrival, find the bricklayers or some other laboring class out on strike and be asked to come out in sympathy. It would be their duty to do so if they upheld their organization, but he could not think our seamen would ever place themselves in such an unthinkable position.

The secretary was then asked to address the meeting. He took up the matter of their first annual report, and went on to say that the work had been accomplished with what seemed a very small amount of effort on the part of the membership during the year. Only about 10 or 12 had sent in fees from new members, and as for himself, he had not contributed 50 per cent. of the effort that should have been made by any one member. While admitting this, he hoped the members would take into consideration the position of a man trying to make a success of 2 or 3 different lines of work at the same time. During the year 1919 he tried to impress on the membership the great need there was for them to solicit, and keep on soliciting until they had sent in at least some new members. If each and every member would make his objective 10, this would put their institution in excellent condition, proving both to their Government, employers, and communities that they were putting forth an effort to build up their profession. These efforts would entitle them to better conditions legislatively, financially, and otherwise.

He also stated that he had heard of an organization under the name of the

"International Masters, Mates, and Pilots Association," incorporated with the labor unions of the United States, which had been reported to be doing business in some parts of Canada. He said it was hard to believe that the masters, officers, pilots and seamen serving on board our Canadian vessels would ever allow themselves to be tied up to such organizations, as by doing so they would admit their inability to look after their own professional interests. Surely they must understand they would be proving themselves unworthy of either the co-operation of their Government or the sympathy and support of their communities. These three items they must secure before they could even think of commencing to build up the integrity of their profession. He believed the masters, officers, pilots and seamen of Canada were worthy, and had the ability to carry on the work of reconstructing and building up their profession without seeking assistance or support outside the British Empire. He went on to say that although he was in sympathy with all organizations, he believed no profession could be governed successfully, except through the representation of those actively engaged in carrying it on. As international trade and commerce under our own Flag is the only means we would ever have to gain and maintain world-wide power and influence, was it not the duty of our seamen to watch over and safeguard the mercantile marine of Canada from all such entanglements? Remember that there is a very large alien population amongst us as well as in the United States, and that it has been proved without doubt the majority of this alien population remained true to their fatherland. For this they should, and must be, both honored and respected, yet their duties to these several fatherlands are to use their whole power and influence to undermine the international trade and commerce of Canada. They are trained to realize that these are the only means whereby they can ever get us under their control, and the Canadian Merchant Service Guild is calling to every Anglo-Saxon living within the borders of Canada to join with them, so that they can work with their whole united power and might to exterminate this parasite, which is eating into and contaminating the whole inspiration of the Anglo-Saxon race.

After enrolling several new members the social evening closed with three cheers for Canada, her seamen, and our mercantile marine.

At 10 a.m. the following day the management committee resumed their duties. It was decided that a monthly magazine be issued at the very earliest date possible, made up in the following manner: first section, Educational; second section, Guild Work; third section, Miscellaneous; fourth section, Letters to the Editor.

Moved, seconded and carried, that the following legislation be placed before our Parliamentary Committee, if possible, at this session:

(1) That the Government be asked to create a fund which will give seamen free hospital attention when necessary, the same privilege to be extended to fishermen and lighthouse keepers.

(2) That all bridges across Canadian rivers and canals be provided with suitable signals to inform those in charge of our vessels that such will be opened before approaching close enough to endanger life and property.

(3) That every Canadian vessel be officered by Canadians, and that every such vessel leaving port be in charge of a certified person.

(4) That every Canadian vessel of 500 tons or over be provided with a master, 1st officer, and 2nd officer, and that every Canadian vessel less than 500 tons and operating more than twelve hours per day, with the exception of vessels employed solely in fishing, shall be provided with a master and one officer, these officers to be recognized as such by the Government.

(5) That every Canadian vessel be manned, as may be found necessary to the safety of public life and property afloat.

(6) That Canadian coastwise trade be reserved solely for vessels, truly and without fraud, owned by the communities of Canada.

(7) That our Canadian Shipping Act be revised to conform to the necessities of our mercantile marine.

(8) That every master, pilot, and officer who considers himself not fairly dealt with by our courts of enquiry shall have the privilege of appealing to the Admiralty Court for final decision.

(9) That a ruling be given regarding the articles supplied to our coasting vessels, as it contains the insignia of the British Empire, and at present people do not seem to understand its importance.

(10) That our Government be asked to introduce legislation which will give all seamen of Canada the use of their franchise.

(11) That Otter headlight on the north shore of Lake Superior be immediately put into commission, and a fog signal installed at that point.

(12) That our Government, without further delay, take up the matter of installing life-saving stations equipped with wireless, more especially along the north shore of Lake Superior.

Moved, seconded, and carried, that the nautical school in Collingwood be put under the auspices of the Canadian Merchant Service Guild, and that such educational institutions be inaugurated throughout the Dominion as soon as the progress of the institution will allow.

Moved, seconded, and carried, that Capt. D. J. Stitt, Capt. A. McIntyre, and Capt. A. Baxter, fill the position of Advisory Board for the year 1919.

The business being completed, the chairman thanked those present for their harmony and assistance. He wished the C. M. S. G., if possible, greater success for the year in which they have just entered.

The session was then declared closed.

London.—One of the navy's secrets that has been disclosed since the cessation of hostilities is the use made of otters or Paravanes (called P.V.'s for short) in enabling ships to pass through minefields with almost complete immunity. These devices were towed in pairs, one on either side, from a point as low down as possible on the ship's bows, in such a way that they were not in the ship's wake but stood out obliquely away from the hull. When a mine-mooring cable was encountered it was forcibly deflected from the ship and along the whole length of the towing rope until it came to the Paravane itself. Here it encountered scissors or shear blades which, although it was made of steel 1½ in. diameter, cut it as easily as a pair of scissors cuts a piece of string. These blades, which were only 10½ in. long, with a section about 1½ in. wide by ½ in. thick, had to be made of exceedingly fine and strong steel, and after long and extensive tests by the Admiralty, the "Triumph Superb" high-speed steel, manufactured by Messrs. J. J. Saville and Company (Limited), of Sheffield, was exclusively adopted for them. The whole efficacy of the Paravanes, so far as mines were concerned, depended on these cutter-blades, for if through becoming blunt or breaking they failed to cut the cable, the mine would remain submerged and dangerous, whereas if it was released and rose to the surface it could be immediately detected and destroyed. When one realizes that the size of cable anchoring the German mines was 1½ inches in diameter, the efficiency of the Paravanes was most astonishing. As the secret of these steels is released commerce will be immensely benefited in their application.

Australian Trade. — Two representatives of an important Australian company will shortly arrive in Canada with a view to interviewing Canadian manufacturers who may be able to supply articles required in Australia. The following lines are of particular interest to this firm: Galvanized black and steam tube, bar iron, steel boiler plates, rivets, bolts and nuts, galvanized corrugated iron, black steel sheets, aluminiumware, enamelware and engineers' requisites in general. They are engineers and contractors in a very large way of business, with warehouses under most capable management at Melbourne, Sydney, Brisbane, Adelaide and Perth. They do a very extensive trade generally, besides being successful contractors to various Commonwealth and State purchasing departments. If interested in this communicate with Commercial Intelligence Branch of the Department of Trade and Commerce, Ottawa, and mention reference number 627.

Educational Items on the Rule of the Road

A Series of Questions and Answers For the Help of Intending Candidates For the Higher Positions in the Mercantile Marine of the British Empire—This Will Appear Monthly

A SERIES of items each month will be given on such subjects as pertain to the sailor, viz.: Rule of the Road; Chart and Its Use; Deviation; Variation; Navigation and Seamanship. For lack of space, etc., any one subject may be continued from month to month.

The Rule of the Road on the ocean, Great Lakes and their tributaries, rivers and waters, as per Shipping Act, are laid down as "articles," and in using these articles seamen must remember their good judgment is often called for and that only one article tells him he "shall" (note Article 18), other articles tell him to keep out of the way, stand on, or use his judgment. Remember we can navigate a vessel with perhaps more safety during daylight than at night. By day we see the other vessels, but remember that when you see a vessel at night you must make sure whether it is a sailing vessel or a steamer, and that is known by her lights. We see few sailing vessels on our lakes these days, but if a model is put before you by an examiner or board of enquiry, and that model has a green color only it is a sailing vessel. Many of our lake men, not thinking of such a vessel, are apt to say or think it is a steamer, and act accordingly; this leads to trouble. A steamer always keeps out of the way of a sailing vessel, except in the case of a sailing vessel overtaking a steamer. This shows how necessary it is to study the Articles with thought.

Question.—When is a vessel supposed to be under way according to the rules of the road?

Answer.—When she is not at anchor, or made fast to the shore, or aground.

Question.—When are vessels to carry their side lights and mast-head lights?

Answer.—From sunset to sunrise in all weathers when they are making way through the water.

Question.—How are small vessels to carry their lights in bad weather?

Answer.—They must have them lighted and ready for use so that on the approach of another vessel they can be exhibited in sufficient time to prevent collision, and the outside of the lantern should be painted the color of the light it contains, and great care should be taken not to exhibit the green light on the port side, nor the red light on the starboard side.

Question.—What lights should a steamer and a sailing vessel show while at anchor?

Answer.—A vessel less than 150 feet in length shall show, while at anchor, in the forepart of the vessel where it can best be seen, one bright white light, visible all round the horizon for a distance of at least one mile. A vessel of 150 feet and upwards in length shall carry while at anchor in the fore-part of the vessel, where it can best be seen, one bright white light, visible all round the horizon, and at or near the stern another such light, to be carried at least fifteen feet lower than the forward one, both lights to show for a distance of at least one mile.

Question.—What lights and signals would you exhibit if your vessel was aground in a river or narrow channel?

Answer.—At night two red lights in a vertical line six feet apart, forward, where they can best be seen, and anchor lights in addition. By day, two black balls or shapes forward, where they can best be seen.

Question.—What are the heights to which the lights should be carried, anchor lights and masthead lights?

Answer.—Steamers of less than forty tons shall carry their masthead light not less than nine feet above the gunwale. Steamers of forty tons and upwards shall carry their forward masthead light not less than twenty feet and need not exceed forty feet above the hull, their after masthead light to be carried at least fifteen feet higher than the forward one, both lights to be placed in line with the keel and so that the horizontal distance between them shall be greater than the vertical. The forward anchor light to be carried at the same height as a steamer's forward masthead light. The stern anchor light shall be carried at least fifteen feet lower than the forward one. Small steamers carrying lights such as are carried by seagoing vessels may carry their masthead lights at a less height than nine feet, but they shall always be carried higher than the side lights.

Question.—With what apparatus must every vessel be provided to enable her to proceed in fog, mist, falling snow, or heavy rain storms?

Answer.—She must be provided with an efficient siren or whistle, sounded by steam or some substitute for steam, so placed that the sound may not be intercepted by an obstruction, and with an efficient foghorn, to be sounded by mechanical means, and also with an efficient bell.

Question.—What is the range of visibility of anchor lights, masthead lights, side lights, and stern lights?

Answer.—Anchor lights shall show all round the horizon for a distance of at least one mile. Forward masthead lights to show over twenty points of the compass from right ahead to two points abaft the beam on each side of the vessel for a distance of at least five miles. The after masthead lights to show all round the horizon for a distance of at least three miles. Sidelights to show over ten points of the compass from right ahead to two points abaft the beam on their respective sides, for a distance of at least two miles.

Stern lights to show over twelve points of the compass, from right ahead to six points on each side of the vessel, for a distance of at least one mile.

Question.—What light is to be shown when being overtaken by another vessel? How is it constructed and screened, if it is screened at all?

Answer.—A vessel being overtaken by another vessel shall show from her stern to such last-mentioned vessel a white light or a flare-up light. The white light may be carried in a lantern, but in such case it shall be fitted and screened to show over twelve points of the compass from right to aft to six points on each side of the vessel, and should be carried as near as possible on the same level as the sidelights.

Question.—Mention the lights and day signals to be shown by vessels not under command.

Answer.—A vessel not under command shall carry in the forepart of the vessel where they can best be seen, two red lights in a vertical line not less than six feet apart, visible all round the horizon for at least two miles. By day she shall carry in the forepart of the vessel where they can best be seen, in a vertical line not less than six feet apart, two black balls or shapes at least two feet in diameter. A vessel employed in laying or picking up telegraph cables shall carry in the forepart of the vessel, where they can best be seen in a vertical line not less than six feet apart, three lights visible all round the horizon line for at least two miles, of which the highest and lowest shall be red in color, and the middle one white. By day she shall carry in the forepart of the vessel, where they can best be seen, in a vertical line not less than six feet apart, three shapes, each of at least two feet in diameter, of which the

highest and lowest shall be globular in shape and red in color, and the middle one, diamond in shape and white.

Question.—How would you ascertain if there is danger of collision when approaching a vessel by night?

Answer.—By carefully watching the compass bearing of an approaching vessel's lights. If the bearing does not seem to change, risk of collision should be deemed to exist.

Question.—By what signals can you indicate to another vessel the course you intend to take?

Answer.—One short blast to mean, "I am directing my course to starboard"; two short blasts to mean, "I am directing my course to port"; three short blasts to mean, "my engine is going full speed astern."

Question.—You are in a steamer and see the three lights of another steamer right ahead. What should or would you do, and state the reason for your action?

Answer.—Blow one short blast on my steam whistle and alter my course to starboard. When two steamers in front of one another are meeting end on, or nearly end on, each shall blow one short blast on her steam whistle, and alter her course to starboard.

Question.— What is the rule for a steamer having to keep out of the way of another vessel?

Answer.—She shall, if necessary, slacken her speed, stop or reverse her engines.

Question.—What is the rule for a vessel having to keep out of the way of another vessel?

Answer.—She shall, if possible, avoid crossing ahead of the other vessel.

Question.—What is the rule for a vessel overtaking another vessel?

Answer.—She shall keep out of the way of the vessel she is overtaking, and nothing will relieve her of that duty until she is finally past and clear.

Question.—What are the signals of distress to be shown by night and by day?

Answer.—The signals of distress to be shown by vessels during the night would be as follows: A gun or other explosive signal fired at intervals of about one minute. Flames on the vessel (as from burning tar barrel, oil barrel, etc.); rockets or shells throwing stars of any color or description, fired one at a time at short intervals; a continuous sounding with any fog signal apparatus. During the day: A gun or other explosive signal fired at intervals of about one minute. The International code signal of distress indicated by N. C. The distant signal, consisting of a square flag, having either above or below it a ball or something resembling a ball. A continuous sounding with any fog-signal apparatus.

Question.—How many articles on the Rule of the Road refer to lights?

Answer.—A description of all lights is given in the first eleven articles.

Question.—What article in the Rule of the Road tells you what to do to keep out of the day of another vessel?

Answer.—Article 18, which says that when two steamers are meeting and on, or nearly end on, each shall alter her course to starboard.

Question.—How many articles are there in the Rule of the Road for inland waters?

Answer.—The Rule of the Road for inland waters contains 32 articles.

(To be continued next issue, which will come forward in May.)

What the Paravane Did

NOW that the British navy has completed the task that was set before it during the war, some of the "secrets" are beginning to come to the surface. Considering the efficiency of the German spy system the remarkable thing is that such remarkable appliances could have been applied to naval vessels without the secret going to the Germans.

There have been numerous stories—some of them very good ones, too—of how the British fleet was dealing with the sunken-mine menace. We have been told of mysterious grappling chains, of nets and of mysterious contrivances that gathered up the submarines and stacked them on the shore.

But the story is now out, and there is nothing mysterious or unreal about it. It was simply a case of pitting British brains against German deviltry, and in the contest British brains won. In fact, it looks as though the efficacy of the moored mine as a means of destruction had been largely discounted.

As we have said, the Admiralty equipped in the neighborhood of four thousand vessels of all types with the otter gear, and there is no question but that this vast programme paid for itself over and over again in the vessels which were saved from damage or destruction. Soon after the United States joined forces with the Allies, an arrangement was made with the Admiralty to permit the building of the gear in this country, and up to the time of the armistice several hundred vessels of the Navy and Emergency Fleet Corporation had been equipped.

A vessel was, or rather still is, engaged in the testing of paravanes after they come from the factory, for those vessels already fitted are still using their paravanes, and in all probability will continue to do so until all danger of mines has been removed.

The name of the contrivance probably gathers its first syllable from the Greek prefix "para," meaning "along side of," for that is just where the Burney gear was towed. Commander Burney was the inventor of the Paravane, and in some cases it is still referred to as the "Burney gear." The contrivance was first perfected in the naval yards at Portsmouth, England, in the dark days of the war when the mine and submarine were making it hard work for the Allies to keep their tonnage totals from going back rapidly.

The Paravane has won its place in the sphere of truly great things.

Staggering Totals

FIGURES that are being computed now in regard to the casualties of the war are so colossal in their aggregates as to baffle intelligent comprehension.

It may seem strange to make the statement, but it is a fact that the human mind gathers very little detail from the bare statement that over 7,000,000 men were killed in the war.

The figure is too big. It may be reduced by one who has a love for mathematical detail to the point where it might be a two-abreast endless procession.

There were mobilized by all the nations 59,176,864 men. Killed, 7,781,866; wounded, 18,681,257, and prisoners or missing, 7,080,580.

Civilian deaths were also large, especially in countries where whole territories were forced to flee before invaders, and where hunger and disease played havoc. In fact, figures used by the *Current History Magazine* give it that 9,185,329 deaths in civilian life were due either directly or indirectly to the war, making a total death list of nearly 17,000,000 people.

In proportion to enlistment, Serbia was the heaviest loser for the Allies, with 45.5 per cent. Others follow in order:—

Serbia	45.5
Rumania	26.7
France	18.5
Russia	14.2
British Empire	9.2
Italy	8.4
Belgium	7.5
United States	1.6
Bulgaria	50.3
Turkey	18.8
Germany	14.6
Austria-Hungary	12.3

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

SHIPS LIFE-BOATS

IT may be well to start this article by discussing the various ways of handling small craft under different conditions. An up-to-date officer must be conversant with power launches as well as oar and sailboats, and the test generally comes in heavy weather, so duck-pond seamanship will not be mentioned here.

The Power Life-Boat—Disabled

The danger here is that your boat will, if left to her own fancy, lie in the trough of the sea, with wind and waves abeam. Such a condition invites rolling, shipping of water and perhaps maiming those on board. If you are on a lee shore, i.e., land to leeward, you must consider two main points of procedure which hinge on the nature of the coast.

If the coast carries "bold water" the usual cliffs, rocks and surge will make it imperative to stay at sea, as a landing is only possible on such a strand when the weather is fine, and then it is hazardous. A sea anchor must be used in an attempt to keep the boat's head to the wind and sea until the engine is repaired. Regulation sea anchors are part of each boat's equipment, but where everything is against you just substitute any piece of rope with some floating material attached to it and ride to that. Make fast the riding gear forward but a little on either side of the boat's fore and aft line. Riding directly from the boat's stem ring causes unnecessary diving.

Always bear in mind to have the greatest weight in any boat as nearly amidships as possible. Having the bow and stern comparatively light allows the little craft to behave her very best when bobbing up and down on the seas.

Lee Shore But Good Landing

With your engine beyond repair and jury rigs (oars or sails) out of the question, give up the sea-anchor business and prepare to "run" for the beach. If you have been laying head on watch for a smooth wave and use oil if you have any. By guesswork put the boat by the stern and have two or three men in readiness to spread their oilskins to the wind from aft. These men must sit or stand forward, as to expose canvas or improvised sails aft would mean disaster in this case. The life-boat will soon gather headway, and with careful steering toward a likely part of the beach things ought to be reasonably safe. Of course one doesn't expect to get ashore dry-shod in say half a gale of wind, but if luck is with you it is likely that you will be spewed up in the shallow undertow, where a shipwrecked sailor still has a chance of claiming some real estate. If the coast is inhospitable a turned over boat makes a pretty fine hotel till the elements show a softer nature. In making for the beach it is quite possible that now and again a heavy sea will find its way over the gunwale, and in such cases have your crew ready to bail it out with hats, shoes, or other devices as well as the regulation bailers. It is wonderful what punishment a small boat will take if every person on board knows how to act in the different emergencies.

Power Life-boat on a Weather Shore

Again assuming that your engine has given out and oars and sails are not available, to nurse your craft is still your only salvation. A weather shore means that the wind and sea are off the land, so if your little craft is in soundings it would be best to use some kind of anchor or ground tackle, and have all preparations made to signal to a passing vessel or a nearby lighthouse. With no soundings the sea anchor must be used, which of course means drifting further from your goal, the land. With due regard to always avoid extreme experiment with a boat's trim, it is advisable to have a boat either on an even keel or slightly by the head when riding to any kind of an anchor. Where you are nearly positive that your engine is entirely beyond repairs, and its weight is only jeopardizing the whole outfit, don't hesitate to throw it over into Davy Jones' locker. Remember that you are only in love with that life-boat in so far as its usefulness is concerned in saving your skin and those under your charge. The slogan in a life-boat is "to get ashore," and the ways of doing that are only measured by the officer's ingenuity to grapple with all odds that appear.

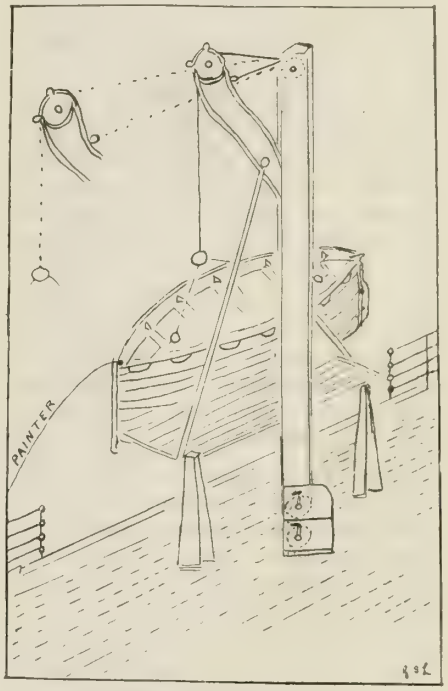
"Running" in Life-Boats

This is in reference to a small craft under power, sail or oars. As I have explained in other articles "running" to a sailor means having the wind and sea quarterly or aft. Whilst this is the most favorable way for a craft to get speed towards her destination, there comes a time when precautionary measures must be taken to avoid the serious trouble termed "broaching to," i.e., the boat refusing to keep on her prescribed course, and rushing into a broadside position to wind and sea, where, of course, disaster by capsizing or foundering is ever present. Remember we are studying heavy weather conditions.

To guard against your boat "broaching to" it is well to have a stern drag which is put into operation when the attempt at suicide comes on. I show one in the illustration. You tow this device over the stern with a double line (patent log line stuffed will do) allowing the affair to tow on the easy plan, but should the boat refuse to answer her "weather helm," i.e., refuse to "pay off," let the drag tow from the other rope, and immediately the canvas bag will fill from the open mouth and pull the boat's stern back to its appointed place. Such a plan necessarily reduces the boat's speed pro tem, but that is immaterial. When the boat is on her course again change to easy drag as before. The drag or "drogue" is used by the life-boat institutions of several countries, so it must be of great practical benefit to those who battle with adverse winds and seas.

Sailing a Ship's Life-boat

The writer hopes that the day is coming when every merchant ship will be forced by law to carry at least one power life-boat. At present a great many coasting craft have motor life-boats, and the big liners carry one each to tow any helpless boats in case of ship abandon-



MODERN LIFEBOAT CRANE.

ment, but the sailor student must remember that the time will never come when he can afford to disregard sailoring with non-mechanical boats. Sails and oars will be depended upon until the end of time.

Where ships are abandoned far from land it stands to reason that their life-boats must do some travelling under canvas, so let us get down to a squally night away from the parent vessel. Every decade finds the Government regulations in regard to ship's life-boat equipment slightly changed in minor details, but thank God that Ottawa cannot change the laws of general seamanship, so no matter what rig your boat may have the method of safeguarding her will be the same in respect to wind and waves. Even with a motor life-boat you may have to sail her for hundreds of miles.

Danger of Capsizing

To nurse your sailboat in squally weather with wind from two points abaft the beam to close hauled always "luff" (helm down), keeping forward leech on the lift or shiver during the puffs. Experience will teach you to get the boat in this position before the squall hits you. With wind freer than two points abaft the beam, "keep her away" (helm up) till the granite punch is out of the squall. Each gale system has a series of squalls which gain in ferocity and frequency as the storm rises, and grow less ferocious and less frequent as the storm abates. Don't hesitate to let rip a sheet if you are suddenly struck with a white or unannounced squall. At times it will only be necessary to ease the main and jib sheets to serve the purpose if the overhead conditions of cloud assure you that the pressure of wind is not likely to increase. All men who are not actually "tending ship" must keep below the thwarts.

The lug sail is not shown in the illustration to advocate its use in any lifeboat, but rather to show perhaps the simplest canvas outfit for a ship's boat, in the hope that if some of your complete outfit was lost or damaged, you could still make such a contrivance as you see here from the rags, spars, oars and bits of rope available. Things don't always go a la Muskoka when you are wrecked. You will note that the yard is grommetted to the mast with hook and ring, also that the halyards set up to windward abaft the mast, while the tack hooks on to the stem or thereabouts. A bullseye or thimble in the clew will allow of a double sheet being rove or again you can use a single rope. When tacking you lower the yard and dip the tack and halyards over. There are other more efficient rigs, such as the standing lug, with a boom on the foot, and also the mainsail and jib outfit, but both these latter mentioned need much more gear and attention than the dipping lug. Like lateen rigs, lugs require no head sails or jibs, and no shrouds for mast support.

Where it is impossible to carry canvas on your frail craft, and your crew is too exhausted to attempt rowing, throw mast and sail overboard, and ride to it with your longest painter. This makes a good sea anchor until the weather favors more genial seamanship.

I have already spoken of "tacking" and "wearing" in a recent article, so that for small boat work I need only remind you of "jibe-ing" as it is nearly always accompanied by danger. Jibe-ing can either occur when you wish to change your course, or when a shift of wind jumps from your port to your starboard quarter or vice-versa. The booms and sheets need attention and any spar or tackle is easily damaged by sudden strain if the crew are not "handy." To keep things normal you must just try to jerk your craft dead before the wind till the slack of the boom sheet is in control, then ease the boom away over the changed lee quarter. It is easily seen that a boat carries her boom well inboard when close-hauled, but almost at right angles to her keel when the wind is well aft,

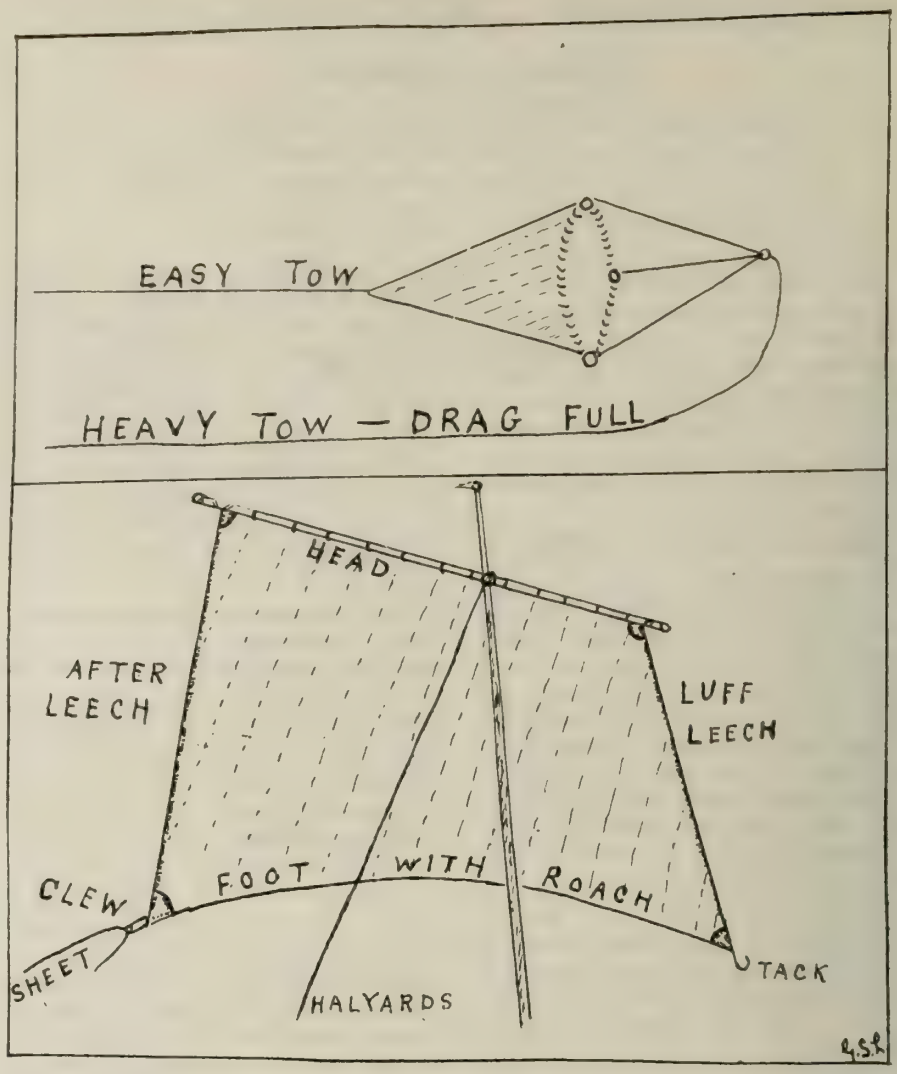


DIAGRAM OF BOAT SAIL.

hence the extra trouble and danger with wind jumping around the stern, the boom having to describe a semi-circle.

Sculling—Single Oar Manoeuvre

No young man should be handed a certificate of competency from the Marine Department at Ottawa unless he has demonstrated to the examiner that he can scull a boat with one oar over the stern and give the wee craft considerable way. Besides giving the small boat headway the single oar over the stern can be used for a rudder, as you witness it in the illustration, and neither of these stunts can be learned from book study. Jump into a boat the first opportunity and go to it. Like all other manipulations it is not so easy as it looks. You have to cut a figure of eight with your oar blade, and the power generated is wonderful. Even at this moment in Chilian roadstead 10 and 20 ton barges are propelled by this means, and a good British sailor can scull a ship's boat with one oar at the rate of at least four miles an hour.

Holed, Leaky or Rudderless

If ice or rocks have actually holed your boat use the nearest approach to a collision mat, i.e., jam some clothing into the breach. Collision mats are very useful articles made from three or four ply of canvas, and the size of a big tarpaulin. This is stiffened with sennit or roping and put on a roller. Then should the ship be holed about the water line, the mat is unwound over the vessel's side and the inrushing water seals the mat into the hole. Of course, these mats are only used on large craft, but the same principle holds good for your boat. Sometimes a boat which has been on the skids for a long time without being wet, will leak very badly the first day and then take up. Again a boat may have an open seam just on the water line, in this case give your wee craft a list of a few degrees and that will help, until you do some crude caulking from inboard with a jack-knife and some spun yarn. Don't despair if your rudder is broken or lost, as an oar is as good as a rudder any day. The oar for this purpose is kept in its place by a grommet, and both leverage and canting the blade causes the boat's head to swerve in the desired direction. The very first rudders were just huge oars balanced on either of the boat's quarters on a swivel, and allowing a certain freedom each way. A peep at any old print of a Chinese junk or a Viking craft will prove this statement.

Don't forget that in tacking with a ship's boat a lee oar shoved out for a

minute or two when she is lazy "in stays," i.e., "going about," will greatly aid in the manoeuvre.

There is nothing under the sun which will make a young man conversant with boats quicker than examining thoroughly the boat's and accompanying gear of his own vessel. Davits, guys, life-lines, tackles, and equipment in general should be overhauled and the first opportunity of launching a life-boat should be taken advantage of. In no other way can the mates of any vessel have a solid idea of how to act in an emergency. Where the davits rest in a shoe see that some black lead and tallow is used to keep them from getting paint or rust frozen. The detailed equipment which the law requires a life-boat to have may be found in a little blue book issued by the Marine Department, and in this respect it is well for nautical students to write to Ottawa and get every conceivable booklet which the King's Printer puts out on marine affairs.

The illustration of the single crane davit is representative of the latest attempt to handle ship's life-boats with



LOWERING THE LIFEBOAT.

speed and safety, but the two-davit outfit is still in use in 9 vessels out of 10. Never lower a boat without passing the painter in the right direction. The right direction depends, of course, on whether the ship is moving or aground, and how the tide, waves, current and wind affect the situation. Should the parent vessel be moving slowly ahead the after davit tackle must be unhooked first. This particular point is where the single davit overcomes a difficulty, as suspension is by one rope only. Where clip hooks are used in davit guys see that they are "moused"—lashed together to prevent opening.

I can't imagine a young officer finding himself in a more responsible position than in having charge of a ship's life-boat, with 20 or 30 souls in his keeping and the parent ship sunk or on fire. The chivalry which is in the blood of the Britisher is tested to its limits when men and sometimes women and children are huddled together in a 30-foot life-boat, with a half-inch plank between them and eternity, and the sky and clouds their only roofing.

In going alongside of another vessel to take off a ship-wrecked crew it is customary to get under the distressed vessel's lee, but it must be remembered that great danger sometimes exists in the lee of such a craft from hanging wreckage or flotsam. For this reason it is often necessary that the derelict crew be pulled into the life-boat by a life-line at a safe distance from the dangers of her lee rail. Again, where you are in soundings, it is not uncommon for the rescuers to drop hook to windward of the wreck and then pay out a life-buoy or jacket which will drift down on the sufferers and act as the medium of transit. Then a predicament may come your way which can only be solved by taking a shipwrecked crew from the bow or stern of a craft, that has one and submerged, so that every particular case has its own cautious procedure, the one outstanding feature being to nurse your frail boat from contact with anything but water.

Where you are being towed by the parent steamer, pass the tow rope around the forward thwart, and the life-boat will steer nicely clear of the big vessel. One man must sit on the thwart in question and pay attention to the tow rope only. This refers, of course, to the boat's thwart nearest to the big ship's side. Then when you wish to cast off pass the tow rope along to the boat's quarter and she will break her sheer and avoid hugging the parent vessel's side as she might do if handled in a clumsy manner, and if there is any helpless position to get into when life-boating it is to be drawn against one's will under the quarter of a big vessel to be churned up perhaps by the propellors.

Young men, study your life-boat problems, for you may have to give an account of such practical knowledge on your first trip as an officer. When the writer was an apprentice in sail, a lad of seventeen brought a large sailing ship into a colonial harbor, all the navigating officers having died at sea. When rated as second mate on a tramp steamer I had to clear the ship through the agent, put to sea from Tampico, Mexico, and make the coasting trip to Galveston, Texas, as acting captain, for the master, chief mate and third mate were all raving with malaria and confined to their berths. No junior knows the moment he may have to show his metal at the hazardous calling of the sea, either in the life-boat or parent ship. In this respect your profession is unique, and as young Canadian merchantmen, the Dominion looks to you for its success on the seven seas.

Big Deal Through—One of the biggest deals on record, one that will place the famous Vickers Company in an unrivalled position in the engineering world, has just been arranged with Treasury sanction. Vickers, Limited, is to acquire the Metropolitan Carriage, Wagon and Finance Company, of Birmingham, whose shares have an aggregate value nearly equal to those of the Vickers Company itself. Vickers Limited, formerly known as Vickers, Sons & Maxim, has consistently increased its business by important acquisitions, with the result that it has either absorbed, or obtained a controlling interest in the Naval Construction and Armaments Company, the Maxim-Nordenfelt Guns and Ammunition Company, Wolsely Motors, and the Electric and Ordnance Accessories Company. Among the countries to which its interests extend are Canada, Spain, Italy, Russia and Japan. It has works in Sheffield, Barrow-in-Furness, Birmingham, Erith, Dartford, Crayford and Ipswich.

Will Finish Boats.—At a meeting of creditors of the Polson Iron Works now being reorganized, held at Osgoode Hall, it was stated that as the result of agreements come to it would be possible to declare a dividend of 54 cents on the dollar. One of the agreements comprised the offer of the Imperial Munitions Board to advance the $400,000 to $600,000 necessary for the completion of five boats under contract, to accept delivery when ready, to waive any claims for damages, and to rank with the unsecured creditors for the money it was found necessary to advance. The Hannaveig Company, who had placed with the company an order for two boats to be completed in 1919 at a cost of $665,000, agreed to take over the two boats and the material on hand and to waive any claim for damage or for the repayment of any amount overpaid. The material, which had cost $335,000, was only worth about $200,000 to-day, but the Hannaveig Company was willing to take back the material to free themselves of damage actions by the persons to whom they had sold the boats. Both offers were accepted by the creditors.

London. — The new Cunard transatlantic liners will be oil-driven. An official of the Cunard Line verified this statement. It was told in a recent dispatch as illustrating the intense efforts the great British shipping interests are making to hold maritime supremacy.

Requirements for Certificates of Competency

What Candidates Must Know to Qualify For Masters and Mates of Vessels in Canadian Inland Waters—Length of Service Required For the Various Grades and Types of Vessels

Mate.—A candidate must not be less than nineteen years of age, and must have served two years at sea or on the inland waters, one year of which he must have been as wheelsman.

In Navigation.—A candidate for a mate's certificate will be required: To write a legible hand and spell correctly, to be tested by one-quarter hour's dictation. To determine his position by cross bearings on the chart. To shape a course and determine run from any given departure.

In Seamanship.—He must possess a thorough knowledge of the Rules of the Road (International, and for the Great Lakes) as regards both steamers and sailing vessels, their regulation lights, fog, sound and distress signals.

He will be required to repeat from memory any one or all of the articles "1" to "32" inclusive, concerning the rules of the road, and write the answers to not less than ten questions on the rule of the road, which the examiner will give him.

(b) He will be examined in seamanship generally, either for "square rig," "fore-and-aft," or "steamer"—passenger, freight, or ferry, according to the certificate required.

If For a Steamer.—He must understand the fittings for fire purposes, bulkhead sluices, if any, and telegraph. He must understand the securing and lowering of lifeboats and rafts. He will be required to answer any other questions appertaining to the duties of a mate which the examiner may think necessary to ask.

Master.—A candidate must not be less than twenty-one years of age, and must have been at sea or on the inland waters, other than the minor waters, three years, one of which he must have served as mate whilst holding a mate's certificate.

In Navigation. — A candidate for master's certificate, in addition to the qualifications for a mate, will be required: To explain, on a magnetic or true chart, how to shape a course to counteract the effect of a given current, and find the distance made good toward a given point in a certain time. To answer practical questions on the errors of the compass, and their causes and the correction by the use of the magnets.

In Seamanship.—In addition to the qualifications for a mate: He must know the principal lights on the inland waters and the currents. He will be required to explain how he would lay out an anchor in case of stranding. How to rig a Jury rudder. He will be questioned as to his knowledge of protests, invoices, charter party, and bills of lading. He will be required to answer any other questions pertaining to the duties of master which the examiner may think fit to ask him.

Minor Waters

Mate.—A candidate must not be less than nineteen years of age, and must have served two years afloat, one year of which he must have served as wheelsman.

In Navigation.—A candidate for a mate's certificate will be required: To understand the first four rules of arithmetic. To write a legible hand and spell correctly, to be tested by one-quarter hour's dictation.

In Seamanship.—He will be questioned on the rules of the road, sound and distress signals, and must answer in writing not less than ten questions on these subjects. He will be required to answer any other questions the examiner may think it necessary to ask him pertaining to the duties of mate for the peculiar kind of sailing vessel or steamer for which he desires a certificate.

Master.—A candidate must be not less than twenty-one years of age, and must have served three years afloat, one year of which he must have been as mate holding a mate's certificate.

In Navigation.—A candidate for a master's certificate in addition to the qualifications for a mate will be required: To possess a thorough knowledge of the rules of the road, both as regards steamers and sailing vessels. To understand fog and distress signals. To repeat from memory any one or all of the Articles "1" to "32," inclusive, of the rules of the road. To understand the figures on the chart and to lay out a course from one place to another.

In Seamanship.—In addition to the qualifications of a mate he will be required: To know how to act in a case of stranding. To know the lights and dangers in the vicinity where his vessel is to run, and the currents. He will be required to answer any other questions the examiner may think necessary to ask him concerning the duties of a master of the particular class of sailing vessel or steamer for which he desires a certificate.

Tug Boats

Master.—A candidate must not be less than twenty-one years of age and must have served three years afloat, and must produce satisfactory evidence of ability. He must be able to read and write legibly. He must possess a thorough knowledge of the rules of the road, both as regards steamers and sailing vessels. He must understand sound and distress signals. He must know the principal lights in the vicinity where he is to run his vessel. He will be required to answer any other questions appertaining to the duties of a master of a tug-boat which the examiner may think necessary to ask.

Licensed Passenger Tug-Boats

Master.—In addition to the qualifications required for a master of a tug-boat a candidate must have served one year of the three in a capacity not lower than mate of a passenger tug-boat. He will be examined as to his resources for the preservation of the passengers and crew in the event of wreck, and the steps to be taken if his vessel were disabled in drifting toward a lee-shore. He must also explain what he would do in the event of a vessel taking fire. He must be able to rig a sea-anchor and state how he would keep a disabled vessel out of the trough of the sea. He will be required to answer any other questions appertaining to the the duties of a master of a passenger tug-boat which the examiner may think necessary to ask.

Rules of the road have to be written by all masters and mates of passenger and freight steamers, and passenger and tug vessels.

REPAIR YARDS AT PORT DALHOUSIE

The Montreal Transportation Company now have in full operation at Port Dalhousie, Ont., two drydocks for the repair of both steel and wooden vessels; also full equipment for machinery and boiler repairs. One dock is 250 feet long on keel blocks; 45 feet width of gate, and 12 feet over sill. The other dock is 185 feet on keel blocks; 45 feet width of gate, and 12 feet over sill. Rudder pit in larger dock. The plant has electric light for night work and is equipped, in skilled workmen and in apparatus, for quick and satisfactory work.

The local manager is Mr. H. Bance, while Mr. H. G. McMaster, Marine Superintendent from the Co.'s head office, also gives the yards his frequent supervision. Mr. McMaster's office is being moved, May 1, from Kingston to Montreal in order that the practical department and head office might be the better centralized. The company will still maintain yards at Kingston.

Memories of Henry Morgan and His Buccaneers

Morgan Was Born to Command—The Sacking of the Venezuelan Port—The Attack on the City of Panama—Looting of the City —Morgan Turns Respectable—His End Unknown

CONDITIONS under which trade and commerce of the British Empire struggled for supremacy during the sixteenth century and the class of men who made that supremacy possible can very well be illustrated by one, amongst thousands of others, named Henry Morgan. He came of Welsh agricultural ancestry and was born in the principality in or about the year 1637. While yet a mere lad he ran away from home and selected the sea as his vocation, going in the first instance to the West Indies. In the early part of his wanderings he appears to have worked in the capacity of what nowadays we should term a cattleman—and this work of slaughtering the wild cattle of the prairie and preserving their meat and hides by process of "boucan," is in fact, how the buccaneers of the open West first commenced operations. But they were quick to discover that there were less toilsome, if more risky and bloodthirsty, ways of earning a livelihood than by killing cattle on the pampas.

In those days men's minds were easily inflamed by tales of the fabulous wealth enclosed in the wooden walls of the galleons sailing from Mexico and Peru to Spain. Bartholomew, Mansvelt, and L'Olonnois were the names of some of those reckless spirits who preceded Morgan in the work of sacking the Spanish ships and colonies along the shores of Central and South America. "Spain," as a modern writer has pithily expressed it, "was undoubtedly the most unpopular power that ever dominated the earth. She was also the richest."

Showed Domination Early in Life

Morgan must have been a man of indomitable resourcefulness, marked individuality, and proved capacity for command. Before he was thirty we find him at the head of a dozen small vessels which sailed under no flag but his own, though at a later date we find him assuming all the power and authority of one holding a regular commission from Charles II. He began to be a recognized force in the raiding and harassing of Spanish America about 1667 when he led his buccaneers to the burning and sacking of Puerto Principe in Cuba. This exploit he followed up in the next spring, when, with nine of his small ships and 450 men, he descended upon Puerto Bello—a city which was subsequently the scene of a still more complete triumph by Admiral Vernon. At Puerto Bello the pirates possessed themselves of quantities of treasure, besides actual coin to the value of 250,000 pieces of eight. De Guzman, the Governor of Panama, was actually constrained to propitiate the already dreaded Morgan by sending him the gift of a magnificent emerald ring. This was a compliment from a Colonial Governor to the power of piracy on the high seas, which has rarely, if ever, been excelled. Puerto Bello was ransomed for 100,000 dollars.

Maracaibo Sacked

Venezuela was to be the next point of attack. Early in the year 1669 Morgan placed himself at the head of 800 desperadoes, who manned a squadron of 15 small, but swift sailing craft. To do these men justice, they must have fought as well as robbed and ravaged, for in the overwhelming of the rich ports of Maracaibo and Gibraltar, they not only ran the gauntlet of forts bristling with guns, but also defeated, with a signal loss, a far superior Spanish fleet sent against them. And here the plunder is staggering to the imagination—"money, jewels, silks, raiment, liquors, women, slaves"—everything which went to make up the paradise of the sea. By this time the wide ocean rang with the fame of Morgan's misdoings. He experienced no difficulty in either adding to or manning his craft. The men who shipped with him might be for the most part ruthless miscreants, but they were also good sailors and fighting men, which was all that mattered. That Morgan was getting support, and not merely indirect support, from the high quarters is evidenced by the Governor of Jamaica sending him the "Flying Stag" of 36 guns, which immediately became his flagship. Coolly announcing that he held a commission under his Majesty, Charles II's hand, the corsair assembled an imposing fleet of 37 sail, manned by 2,200 ruffians of the sea. It was now the autumn of the year. This armada, we are told, was divided into two squadrons, under a vice-admiral and other subordinates. The first squadron sailed under the royal English flag, and no more disgraceful band ever served under that noble emblem. The second squadron showed a white ensign, probably French, and Morgan's ship flew a red banner with a white cross, and at the bowsprit a red, white and blue flag—singular precursor of our national colors. Contrary to custom, he took counsel with the principal officers to consider the best point of attack. They warred between Panama, Cartagena and Vera Cruz; the determining factor being not so much, which was easiest, but which was richest. The decision finally fell on Panama. No doubt, De Guzman's emerald, which he still wore, influenced Morgan to this decision.

The Attack on Panama

But a first essential to the reduction of Panama itself was the reduction of the Castle of St. Lawrence, which defended the mouth of the Charges River. For this special service, Morgan detached one Bradley with 5 of the little ships and 400 men. The Castle stood on an almost precipitous eminence and at first sight looked impregnable. It made a desperate and prolonged resistance, so much so that when at last the stormers broke in after several days' fighting, only fourteen of the original garrison remained alive. They had originally counted 350 strong, exclusive of Indians; the assailants had to mourn upwards of 200 killed and wounded. Re-united to Morgan's main body, the stormers of St. Lawrence set out for their objective Panama, on the 18th January, 1670, in a flotilla of canoes and small boats, numbering altogether about 1,300 strong. With consummate hardihood, they set out on their marauding enterprise to rousing shouts of "Long live King Charles of England, and long live Harry Morgan!" It was the beginning of an expedition to be crowded with experiences alike memorable and terrible.

At the very outset, several ships were wrecked at the mouth of the Charges River. The country around was a wilderness, and as provisions rapidly diminished, so did sickness and mortality in the ranks increase. The Spaniard, as they retreated, burned or carried off anything that could provide sustenance for man or beast. A week out from their base of operations the adventurers were already eating stray cats and dogs and in eight days their numbers had been reduced by a couple of hundred. In the ruins of the Town of Cruz they came upon some jars of wine, which, in their weak and famished condition rendered them ill. On the ninth day they were attacked and decimated by Indians armed with the primitive bow and arrow of barbarism.

At length, after days of toil and starvation and when reduced to a few hundred tadderdemalions, they came in sight of the rolling Pacific, as Drake and Hawkins had done a century before. And now, they beheld the beautiful City of Panama, spread like a panorama before their eyes; a white city of rare charm and exquisite loveliness; its stately streets and lordly houses backed by a vista of rolling savannahs and anon by the broad expanse of the blue Pacific itself. It is estimated that at this period of its prosperity, Panama boasted 7,000 buildings and 30,000 inhabitants, its commercial importance being, of course, greatly enhanced by the periodical arrival of the rich River Plate fleet laden with wealth of the Peruvian mines. It was, in fact, "the strongest, richest, most magnificent city in the New World," and a train of 2,000 mules was

employed annually in transferring the product of gold and silver overland to Puerto Bello.

It follows that such a city, "Panama, the gem of the Pacific," was well protected. On the first alarm of the buccaneers' approach, an imposing army of 5,000 strong was drawn up outside the town to arrest their onward progress. Well might the hearts of the handful of ragged and starving pirates shrink at such a sight, and it needed the iron resolution of a Morgan to make them face the music at all. For they knew they fought with halters around their necks, and if they were worsted they would receive short shrift on account of the nameless atrocities whereby they had rendered themselves infamous from one end of the Spanish Main to the other.

The Spaniards, however, having nearly all the advantage on their side, were guilty of one fatal blunder. As they advanced they drove in front of them 200 wild and furious Spanish bulls. The intent was that these creatures, doubly maddened by the goading from behind, should fall upon and gore the pirates, while the Spaniards finished the bloody business with pike and sword. But this otherwise ingenious plan did not allow for the fact that Morgan's men had, in the first place, been accustomed to hunting wild cattle, and in the second place, they were unerring marksmen. Consequently, men and beasts alike were mown down by scores by the deadly fire of the buccaneers, who, after a battle lasting two hours, totally defeated the defending force, killing or scattering them all.

The Looting of the City

The looting of Panama and the surrounding country lasted full three weeks. A brigantine with a cargo of 20,000 pieces of eight was among the booty, but it is good to be able to report the escape of a galleon containing the church plate and 400 ladies of the place. The buccaneers finally quitted the place of smoking ruins on 24th February, 1671. They took with them 175 beasts of burden laden with silver, gold and other valuables, besides 600 prisoners held to ransom. Dissensions immediately broke out among them as to the fair division of the booty, and it is said that Morgan himself submitted to be searched for concealed booty. Arrived at the Chagres River again, the division took place of something like £400,000 worth of valuables, but the freebooters murmured loudly at the unfair apportioning of the booty. In the immediate sequel Morgan deserted his colleagues, stealing away to Jamaica with four or five ships. It was the beginning of the end of his buccaneering days.

In Jamaica he actually received the thanks of the council for what he had done, and, marrying the daughter of a leading personage of the community, he elected to "swallow the anchor" and lead a peaceful life. But only six months later a treaty signed at Madrid recognized England's possession of Jamaica and other settlements, agreeing to the abolition of the buccaneering business. Morgan was therefore arrested and sent to England to answer the complaints of the King of Spain.

He may well have quaked in his shoes, but the hardened ruffian's star never seemed to desert him, and by successfully flattering King Charles and plying him with presents, he not only got off scot-free, but received the accolade from the Royal hand. "Sir" Henry Morgan returned triumphant to Jamaica in 1764, as its Deputy-Governor. Six years afterwards, when the Earl of Carlisle, the Governor, returned home on the plea of ill-health, Morgan was left in charge of the colony. He promptly set himself to hunting down his old associates in crime, claiming that under the treaty of 1670 privateering had been abolished and he had many of them hanged in chains at Port Kingston. On the death of his easy-going patron, King Charles however, his cheerful malpractices were brought to an end and Sir Henry was thrown into prison. Of his subsequent fate nothing appears to be known with certainty. We estimate him as a maker of South America, because he followed Drake and Hawkins and preceded Vernon and Anson in unlocking for Englishmen the treasure houses of the southern continent, albeit his methods were those of the daredevil freebooter rather than the professional sailor fighting his country's battles.

The Spaniards speedily rebuilt Panama, although to this day the ruins of the old town that was razed to the ground may be viewed by the traveler.

Henry Morgan was, without the smallest doubt, monarch of all pirate adventurers who swarmed the Southern Seas during that period. Had his great talents been otherwise directed, he must have taken supremely high rank among the fighters of that lurid epoch.

ATLANTIC CROSSED BY STEAMER FOR FIRST TIME JUST 81 YEARS AGO NOW

London.—At this time when eager preparations are being made for crossing the Atlantic by aircraft, it is interesting to recall that eighty-one years ago "The Times" recorded the departure from the Thames of the first vessel to cross to America under steam. From the issue of March 31, 1939, is reproduced the following paragraphs:

The experiment of a steam voyage from England to America has commenced. On Wednesday afternoon, March 28, the St. George Steam Packet Company's powerful steamship Sirius, Lieutenant Roberts, R.H., Commander, sailed from the East Lane Stairs for New York, proceeding in the first instance to Cork, from where she will start to her destination on Monday next. The Sirius is a vessel of 700 tons with an engine of 320 horse-power, and has been fitted up in most splendid manner. It is expected she will complete the voyage in fifteen days, and so confident are her owners that they have already announced her setting out from New York on the return voyage on the first of May. She carries from London twenty-two passengers, but this number will be considerably augmented at Cork. She does not take out goods, being intended as a passenger ship only.

Quebec Second to Sail

Soon after the departure of the Sirius the American Line packet ship Quebec, Captain Herbert, for New York, came down the river in tow of a steam packet. She carried out 171 emigrants; cabin 17; between decks, 32; and steerage, 122. The latter were chiefly agricultural laborers and their families. Some parties were bold enough to lay a wager that the Quebec would arrive before the Sirius at New York.

The Sirius, however, reached New York April 22, and duly left again for England May 1.

An express message from Falmouth, published in "The Times" May 21, recorded her arrival at that port after a voyage home of eighteen days.

Made Initial Voyage

A five-year-old boy passenger on the outward voyage of the Sirius is still living at Dorset. He is the Rev. V. F. Ransome, a retired country rector, and Rev. F. L. Blathwayt of Melbury, Osmund Rectory, in Dorset, who has just had a conversation with him, informs us in a letter that Mr. Ransome clearly remembers his experiences. Our correspondent says the Sirius was a two-masted, one-funneled steamer, 178 feet in length; she carried 450 tons of coal on the voyage, being loaded almost to the water's edge, but ran so short of fuel she had to burn every spare yard spar, and even rosin, of which she carried fifty-eight casks.

"A printed abstract of her log, which lies before me as I write," Mr. Blathwayt says, "shows she encountered at times heavy seas, gales, sleet and snow, and when the vessel left Cork there were only six first-class passengers left on board, the others being so alarmed by the run down the English Channel that they disembarked and forfeited their passage money."

THE BRITISH NAVY

The First Lord of the Admiralty said in the House of Commons, March 13th, 1919, that it was its duty to see that the Navy was able to perform its duty in its double task of maintaining the integrity of the Empire and playing a continuously leading part in preserving the peace of the world. THE NAVY WILL DO ITS DUTY.

The First Lord of the Admiralty emphasized the fact that the surrender of the German fleet was a greater naval victory than could have been achieved by any action at sea. THE NAVY DID ITS DUTY.

A Talk on the History of the Union Jack

Definition of a Flag—The Beginning and Development of the Union Jack—The Cross of St. George—The Cross of St. Andrew —The Cross of St. Patrick

THE subject of this article will be the "Union Jack," not flags in general.

Now, first of all, what is a flag? Let us say that it something made to display or fly, so that it can be seen; and we have flags made of silk and bunting. For Royalty, silk is used often, and bunting generally. Of course some cheap flags are made out of linen, and such like. Bunting is the best as it stands the strain and is most desirable in many ways.

Our "Union Jack"

From the earliest records we read of such national emblems as banners and ensigns, and all through the Bible we have an ever-recurring allusion to them.

In the early centuries when the Church and not the State was supreme, we find the Cross a prominent figure and recognized as the highest symbol of dignity and honor.

The Red Cross of St. George of Cappadocia — the redresser of wrongs, the protector of women, the model of Christian chivalry—is still the visible sign to us all that his glorious name would suggest wherever floats the British Flag.

The St. George Flag alone is made up of only two colors—white and red. Until the year 1606 the Red Cross was the flag of England, and its subsequent position on the Union Jack indicates the predominant share the English nation bore in creation of the Union, and the powerful position it now holds in its Councils.

Some of you have read of the Spanish Armada, and it was under this flag England defeated Spain, and became proud mistress of the sea.

Her Union Jack, which now floats over more than four hundred million people, comes to us as the record of the growth of a great Christian nation, and traces through centuries of adventure and progress, the gradual development by the British people of constitutional government over a world-wide empire.

Three years after the union of the two Kingdoms, i.e. in 1606, a new ensign was used by order of James I, in which the Cross of St. George was blended with the diagonal cross on a blue ground, of St. Andrew, patron saint of Scotland.

As first in the Union Jack it occupied the place of honor in the upper quartering nearest the staff, these two crosses combined, forming what is known as the first "Union Jack."

With the Union of Ireland and Great Britain on January 1st, 1801, came the final addition to our national flag. This was accomplished by blending with the former designs, the red diagonal cross upon a white ground, generally known as the cross of St. Patrick, and thus forming the meteor flag of England. In its invincible red, white, and blue, we learn how these sister nations are united by courage to build their realm on the sure foundation of purity and truth.

As Canadians, and citizens of no mean country, in the Greater Britain, we share in the glorious achievements of the Union Jack. We are of a race that never counted the number of its friends, nor the number of its foes, when freedom, loyalty, or God was concerned. This is our flag, symbolizing the highest thoughts that have descended from heaven to earth. Ours, too, is the King whose virtues transmute the sacred principles of loyalty into a personal affection. Ours, too, be the daily prayer: "God bless our Church, Our King and Empire, and keep us loyal."

Such is a brief history of our Union Jack. Now let me touch on a few pointers re the combination.

"St. George"

The patron saint of England—St. George for Merry England. Wherever ships have sailed, there the Red Cross of St. George has been carried by the sailor-nation who chose him as their hero. This knight was born, the son of noble Christian parents, in the Kingdom of Cappadocia, and was beheaded for his faith, on the 23rd of April A.D. 361. His memories have always been greatly revered in the East, particularly by the Greek Church.

The form of his cross is that known as the Greek cross, the four arms being at right angles to each other, in this case as a red cross on a white ground.

England is, however, the only nation which has adopted the Red Cross of St. George as its special national ensign.

St. George, the redresser of wrongs, the protector of women, the model of Christian bravery, was a saint of England, was not a sailor, but it was after and in memory of their sailor's victory near the scene of his exploits that the seafaring nation adopted him as their patron saint. It was under this St. George's Cross that Richard the Lion-Hearted, after proving their seamanship in victory, showed the mettle of his English Crusaders in the battles of the Holy Land. and led them to within sight of Jerusalem.

Ye mariners of England,
That guard our native seas,
Whose flag has braved a thousand years,
The battle and the breeze.

"St. Andrew"

The patron saint of Scotland. Tradition runs that the saint, considering himself unworthy to be crucified on a cross of the same shape as that on which his Saviour had suffered, had, by his own choice, been crucified with legs and arms extended npon a cross of X shape, and therefore it has been accepted as the emblem of his martyrdom. How St. Andrew came to be adopted as the patron saint of Scotland there are varied ideas, and opinions. Some say that in the early centuries some relics of the apostle St. Andrew were being brought to Scotland and although the vessel carrying them was wrecked, the sacred bones were brought safe to shore at the port in the County of Fife, still called St. Andrews. St. Andrews is also venerated by the Russians as a national saint, they believing that it was through the apostle St. Andrew that the gospel of Christianity had been brought to their people. Russia's highest order of Knighthood (created in 1698) was the Order of St. Andrew, and the national flag of Russia, borne by all their people, and on their navy, was the St. Andrew's cross. It was also displayed in the Russian navy at the mast-head, as indicating the rank of admiral.

"St. Patrick"

The banner of St. Patrick is a white flag having on it a cross the same shape as St. Andrew's cross, but red in color. St. Patrick was the Christian apostle of the Irish and thus became their traditional patron saint. The history of his life is that he was born in Scotland, at Kilpatrick, near Dumbarton on the Clyde, and being taken prisoner by pirates when a child, was carried into Ireland and sold there as a serf. Having learned the language, he escaped to the continent and afterwards became a Christian, and having been ordained to service in the Church returned to Ireland for the purpose of converting the people.

From such in brief have we a lesson of the crosses placed together in the one flag of 1801. That it is a beautiful flag with its three crosses, its white borders and eight blue triangles, tells a story of our present Empire, and clearly does the position of the crosses teach us the lesson how the three sister nations, supporting each other are all united to COURAGE to build our realm on the sure foundation of PURITY and TRUTH. Such a flag becomes an inspiration, not only to our hearts, but to the mind, and men may well be willing to risk all,, even our lives, for its honor. Such a flag is the Union Jack of our Canada. And now I cannot end my remarks in better words than those written by my true kind friend, Barlow Cumberland. who wrote a history of our Union Jack—"What I have said is the story in a very brief form of the meaning of our UNION JACK"—the emblem of combined constitutional government, the proclaimer of British liberty, the Union sign of British rule.

Interesting Notes From Canada and Abroad

EARLY NAVIGATION
By SANDY McTAGGART

On Saturday, the 6th of April, the Midland Transportation freighter Glenorchy, in command of Capt. F. Burke, left Midland for Lake Erie for a cargo of coal. After working her way through the dangerous ice pack in Midland Bay, until 8 p.m. Saturday night, Capt. Burke considered it advisable to stop his vessel and wait till daylight. To a seaman who understands the responsibility of navigating our vessels through ice packs during the spring and fall, this course showed good judgment on the captain's part. We all know how small a mistake, in cases of this kind, may cause a great deal of damage to the vessel and loss to the owners, underwriters, and others interested. This should go a long way to show the landlubber that it requires energy, brains and forethought to successfully command one of our lake vessels, and that such a position is not all sunshine neither to the master nor his officers.

Let us hope that the community who invest their money in our vessels will see to it that such men be remunerated in accordance with the strenuous duties they must carry out during the season of navigation, so that their vessel may be enabled to pay the necessary dividend at the end of the year.

At seven a.m. Sunday morning, Capt. Burke again started on his arduous task, and at 10 a.m. brought his vessel, safe and sound, out of the ice pack into open water. He proceeded on his voyage without encountering any more ice, passing Sarnia at 10 Monday morning.

We can only wish that Capt. Burke may have the same good fortune during the future years he may be in command.

SEAMEN AND THEIR VOTES IN ENGLAND

With regard to the registration of officers and seamen of the British Mercantile Marine as Parliamentary voters, the Board have informed the Imperial Merchant Service Guild that the second register of electors under the Representative of the People's Act, 1918, is now being prepared. The procedure which will be followed will be the same as that employed in connection with the preparation of the First Register, and the conditions and qualifications are the same, except that the register will include men who have reached 19 years of age on the 15th of January, 1919. Captains and officers of the Merchant Service should, therefore, make a point of applying at a Mercantile Marine office for the paper form which must be filled out, special provision having been dealt with in this respect whereby applications can be dealt with when men are being engaged at a Mercantile Marine office. Any officer or seaman who did not receive a notification that he was placed on the first register should fill in a post card form, obtainable at any Mercantile Marine office, if he desires to be placed in the second register. Our Canadian officers and seaman want a vote the same as any other man, and why not allow it to him, even if away from his home town? It can be done if some influential party will take an interest in his country and seamen.

BONUS IS PART OF WAGES

We understand it is customary with masters, officers and seamen in our mercantile marine, more especially on our Great Lakes, to engage under a system of bonuses. Perhaps it may be instructive to both employer and seaman to know that a case of this kind was tried in London, England, a short time ago when the master of a vessel was called upon to pay an amount equal to 15 per cent. of the wages placed against the names of four seamen left behind in a foreign port. The case was tried under Section 28 of the Merchant Shipping Act. A stipulation in the agreement provided that the bonus should be paid only to those members of the crew who completed the terms of their agreement. The master's representative contended that the men were entitled only to the wages shown in the wage column of their agreement and that they had forfeited the bonus by leaving the vessel before the completion of their contract.

The magistrate held that a bonus, whether conditional or otherwise, was wages and was subject to all the incidents of wages and therefore could not be forfeited by any clause inserted in any agreement between a seaman and shipowner, and therefore gave judgment against the master.

The master then apealed to a Higher Court who confirmed the decision already given. The Lord Chief Justice said: "Bonuses are in Law, wages." It was also held that no condition as to the forfeiture held good as against the seamen. The letter and the spirit of the Merchant Shipping Act prevent a seaman from signing away his right by law. In explanation, it was held that a seaman did not usually make a careful study before putting his signature to a document and that the Merchant Shipping Act was especially framed to protect Jack Tar against himself and the unscrupulous.

OIL FROM COAL

A discovery has been made by a well known chemist who has succeeded in discovering a process to produce oil from steam coals. When heating the coals to 300 Centigrade under a pressure of 200 atmospheres (3,000 lbs.) 85 per cent. of the coals becomes liquid, and the oil thus obtained closely resembles petroleum.

AMERICAN MARINE WAGES

This item is of vital importance to the general public, directly and personally, and a topic always open for discussion. In this connection we have to think of ship owner, stock holder, and those manning our ships. We notice a wage scale for all U. S. officers on all steamships plying from Atlantic and Gulf points, effective from January 1st to May 1st, 1919. They are based on the size of the vessel (vessels being divided into five different classes) and are the same as the rate paid in the coastwise traffic, and do not contemplate the payment of bonuses in any form whatever. Masters will receive from three hundred ($300) to three hundred and seventy-five dollars ($375) a month depending on the size of the ship; chief engineers will receive two hundred and twelve dollars and fifty cents to two hundred and eighty-seven dollars and fifty cents ($212.50 to $287.50); first officers and first assistant engineers, one hundred and eighty-one dollars and twenty-five cents to two hundred and six dollars and twenty-five cents ($181.25 to $206.25); second officers and second assistant engineers, one hundred and sixty-two dollars and fifty cents to one hundred and eighty-seven dollars and fifty cents ($162.50 to $187.50); third officers and third assistant engineers, one hundred and forty-three dollars and seventy-five cents to one hundred and sixty-eight dollars and seventy-five cents; fourth officers and fourth assistant engineers, one hundred and forty-three dollars and seventy-five cents to one hundred and fifty dollars ($150); and the junior engineer, one hundred and twenty-five dollars ($125). "Wage increases which might have been favorably considered during conditions of warfare would not now be warranted, owing to the unsettled conditions following cessation of hostilities," said the award. It was added, however, that as there was no immediate prospect of a reduction in the cost of living the present rate of pay in the coastwise service should not be diminished, but should be made universal for all services from Atlantic and Gulf ports, including West Indian, South American, and Transatlantic services. The new scale is mandatory on all vessels owned or under requisition by the Shipping Board. There was a difference of opinion, however, among members of the Commission, making the award as to the extent to which the award should be mandatory on other American vessels, inasmuch as the armistice was signed after the agreement for the arbitration of the wage scale was made. Owing to the continued urgent national necessity in relation to shipping, however, the Board urged that all private owners and operators of vessels not requisitioned should pay the scale voluntarily to promote stability of conditions and prevent interruption of traffic.

CHILE TO TURN OVER GERMAN SHIPS

The owners of the German vessels in Chilean harbors, having been notified by the Foreign Minister that their vessels would be turned over to the United States under an agrement between Chile and the Supreme Allied Council at Paris, asserted that Chile had no right to give up the ships. The Minister replied that the Government had fully decided to turn the ships over to the Uuited Steates when the demand was made for them. Over fifteen thousand brave sailors of the mercantile marine have lost their lives. They braved the dangers of torpedoes to carry food to the Allies—some were brutally shot by the Huns while in the lifeboats. Their noble lives were given for others. Not being in the Navy their widows receive no pension. The demands of the States are listened to—what about German ships for Canada? Her sailors died and suffered. The heartless Germans carried out the sinking of the Lusitania. Our merchant seamen put to sea with the full knowledge of the risk they ran. Had they not done so the soldiers at the front would have starved and the wretched Huns would have triumphed. Our merchant seamen are now banding themselves together under the name of the Canadian Merchant Service Guild and want and wish every Canadian to take more interest in the merchant seamen and know more of his work and calling.

CUTTING STEEL UNDER WATER

An oxy-acetylene blowpipe of special construction has been used for some time past by a French firm for cutting steel under water, a feat hitherto considered practically impossible. The apparatus consists of a cutting blow pipe supplemented with a small diving bell, to which compressed air is admitted to expel the water. The pressures of oxygen and acetylene required are much higher than those usually employed, and, naturally this pressure will depend upon the depth at which the apparatus is worked. At the trials now being carried out, ships' plates have been cut at a depth of 27 feet under water. It has been proved that arc cutting can be carried out in a similar way, but the apparatus is slightly more elaborate.

Toronto. — The navigation season of 1919 is now officially open between Toronto and Hamilton and Toronto and Port Dalhousie. It will be a month, however, before the Canada Steamships Company will open the season between Toronto, Niagara and Lewiston. Ferry service between the city and island is on now. Operations in harbor improvements will start in the near future, and it is proposed to complete what is known as sections 3, 4 and 5 inside the Western gap. The entire breakwater will be built in 1,000-foot sections, with 40-foot intervals, and will serve as a sheltered waterway for small craft as well as preserve the new shore line.

LETTERS TO THE EDITOR

These columns are to encourage seamen and others to write freely on matters pertaining to the profession and for free discussion, and, when space will allow, letters will be answered, but the editor does not hold himself responsible for views expressed one way or the other. All letters must be over bonafide signatures, not necessarily for publication. Nom de plume can be used if the writer wishes.

The Editor, MARINE ENGINEER.

We hear and read a great deal of organizations and societies. Can you tell me the real objects and aims of the Canadian Merchant Service Guild? We sailors have had more than one organization, but little, if anything, has come of such. The Canadian merchant seamen require an organization and I would like to join such, but first would like to hear and know more. The House of Commons at Ottawa is an organization to watch the interests of the country; housemaids have an organization; ship owners have an organization, why not we sailors? And I hope the Canadian Merchant Service Guild will be supported by both sailors and the public and these two should work together for their mutual interests.

Sailors and ships gained the day and without them we should have lost the war and Germany's flag would be flying at the stern of our ships to-day.

MERCHANT SAILOR.

The Editor, MARINE ENGINEER.

May the writer ask through your valuable paper what is being done to encourage the building up of Canada's trade and commerce under her own flag?

Are our young men following this profession being properly looked after with regard to education, training and accommodation aboard their vessels, and are they remunerated for their labors according to their position and responsibility, attracting the very best class of men possible to the profession, so that in future the red ensign with the maple leaf in its fly may traverse the world's commercial trade routes, demanding that recognition and respect due to Canada and her people?

When we take up our daily press there is plenty of material referring to miners, farmers and producers, but ships and sailors seem to be a dead letter.

Shall we be allowed to inform the people of Canada that this is the situation found in the British Isles in and before the middle of the sixteenth century? At that time they threw their whole life and energy into the building up of industries, without even a thought to the international power and prestige necessary to their existence, until at last they found themselves on the very verge of being swallowed up in the vortex of international trade and commerce, and to the men who made their shipping laws in the year 1651, both you, I and every other Anglo-Saxon living throughout the British Empire owe their very existence as a race of people to-day.

Will the people of Canada profit by the mistakes of their forefathers, or must they also be dragged into this vortex?

The writer would like to hear through letters to the editor what these laws were, how the British Empire prospered under their influence, how long were they in force, and what happened after theiy were abolished; also regarding the education, training and remuneration of our sailors.

SANDY McTAGGART.

MANY CREDITORS IN POLSON AFFAIRS

Statement Handed Out by Official Receiver Clarkson—Some Work to be Finished

ASSETS

Materials and supplies, inventory value	$400,000
Receivables	25,000
Lands and buildings valued at	1,400,000
Plant and equipment appraised at	550,000
Total	$2,375,000

LIABILITIES

Bonded	$300,000
Preferred claims	100,000
Norwegian contractors	568,000
Unsettled damage claims	70,000
Other claims	50,000
Trade creditors	400,000
Total	$1,488,000

MEMO

The Imperial Munitions Board is the owner of five boats and materials therefor, on the premises, the completion of which is being undertaken. The cost of completing these boats is now being ascertained.

The above statement of the situation of the Polsons Iron Works was handed out by the receiver, G. T. Clarkson.

The statement shows that there are nearly two hundred trade creditors. There are two items larger than $20,000 to Canadian metal people, one of over $10,000, and the rest running all the way from a few hundred dollars to $10,000.

The preferred claims of $100,000 are made up of wages, $72,000; Compensation Board, $15,000; taxes, $10,000 and water rates, $3,500.

Two Boats Completed

Since the company went into receivership two of the five boats have been completed for the Imperial Munition Board. Another boat will be ready in May and the remaining two before the close of navigation.

It is understood that the Polsons Iron Works last year received several offers for the undertaking which would have produced a very substantial profit to the shareholders, but under present circumstances it is entirely unlikely that it will be possible to now sell the assets at prices which at the most would leave very much for the shareholders.

Work in Progress in Canadian Shipyards

A Record of Work Recently Completed or in Process of Completion — Principal Features of Specification—Approximate Launching Dates—Vessels on Order

BRITISH COLUMBIA

YARROWS, LIMITED, ESQUIMALT, B.C.
Occupied on marine repairs and marine castings.

H. VOLLMERS, NANAIMO, B.C.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
Building five wooden steamers for French Government. Three of 3,500 tons for Belgian interests.

B.C. CONSTRUCTION & ENG. CO., POPLAR ISLAND, NEW WESTMINSTER, B.C.
Four wooden vessels, 1,800 gr. tons, 2,800 tons d.w.

NEW WESTMINSTER MARINE CO., FT. OF FURNESS ST., NEW WESTMINSTER, B.C.

STAR SHIPYARD CO., NEW WESTMINSTER, B.C.

J. A. CROLL, PORT ALBERNI, B.C.

PACIFIC CONSTRUCTION COMPANY, COQUITLAM, B.C.
Building two wooden steamers of 1,500 tons for French Government. 3,000 ton steamer for Belgian interests. One steamer for Greek interests.

C. E. BAINTER, PRINCE RUPERT, B.C.
Several wooden fishing steamers, for undisclosed interests.

GRAND TRUNK DRYDOCK SHIP REPAIR CO., LTD., PRINCE RUPERT, B.C.

S. A. MOULTON, PRINCE RUPERT, B.C.

BRITISH-AMERICAN SHIPBUILDING & ENG. CO., VANCOUVER, B.C.

JOHN COUGHLAN & SONS, N. VANCOUVER, B.C.
Building four 8,100 ton steamers for Canadian Government. Four 8,800 ton steamers same as "Alaska."

THE FOUNDATION CO., VANCOUVER, B.C.

FRASER VALLEY SHIPBUILDING CO., VANCOUVER, B.C.

GRANT, SMITH & CO., VANCOUVER, B.C.

HARRISON & LAMOND, SHIPBUILDERS, LTD., VANCOUVER, B.C.

LYALL SHIPBUILDING COMPANY, N. VANCOUVER, B.C.
Building eight wooden steamers of 1,500 tons capacity for French Government.

W. R. MANCHION, VANCOUVER, B.C.

STANDARD SHIPBUILDING CO., VANCOUVER, B.C.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
Number of small vessels being constructed at total value of $300,000. 4,500-ton floating drydock, 352 ft. long.

VANCOUVER SHIPYARD, LTD., VANCOUVER, B.C.

THE WALLACE SHIPYARDS, LIMITED, NORTH VANCOUVER, B.C.
Building four steamers for Dominion Government; two of 4,300 tons deadweight and two of 5,100 tons deadweight.

CHOLBERG SHIPYARD, VICTORIA, B.C.
4 1,500-ton vessels for Norwegian purchasers. Keels laid Oct. 4th, 10th and 25th respectively.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
"Teco," 300 tons. Motor coasting freighter fitted with Bolinder 200 h.p. Built for William Mason Rooke.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.

NORTHERN CONSTRUCTION CO., VANCOUVER, B.C.
5 1,500-ton d.w. compound engines, 12 x 24 x 16 stroke, twin screw water tube boilers, 2,000 sq. feet heating surface. Building for French Government.

PRINCE RUPERT SHIPBUILDING AND ENGINEERING CO., PRINCE RUPERT, B.C.
Two 8,100 tons deadweight steamers for Canadian Government.

WESTERN CANADA SHIPYARDS ,LTD., VANCOUVER, B.C.
"War Nootka," Jan. 4, 1918, 3,080 tons (machinery installed at Ogden Point Assembly Sheds).
Six wooden freight steamers, 250 ft. h.p., 259 ft. o. a., 43½ ft. extreme breadth, molded 42½ ft., 25 ft. molded depth., draft 22 ft., 2,800 tons d. w., for undisclosed interests. "War Nootka," launched January 4, 1918. "War Selkirk" launched March 6, 1918.
"War Tatla," "War Casco, "War Chilkat," "War Tanoo," 4 standard vessels now under construction.

CAMERON-GENOA MILLS CO., VANCOUVER, B.C.

THE FOUNDATION COMPANY, VICTORIA, B.C.
Building twenty wooden steamers of 3,000 tons deadweight for French Government.

CLARENCE HOARD, VICTORIA, B.C.
Wooden car barge for C.P.R., Jan., 1918.

VICTORIA SHIPBUILDING CO., VICTORIA, B.C.
Constructing wooden ships for British Govt., 3,500 tons each.

VICTORIA MACHINERY DEPOT, VICTORIA, B.C.
Two 8,100 tons deadweight steamers for Canadian Government.

NEW BRUNSWICK

C. T. WHITE & SON, LTD., ALMA, N.B. (Office at Sussex, N.B., also.)

JAMES X. LENTEIGNE, LOWER CARAQUET, N.B.

INTERNATIONAL SHIPBUILDING CO., NEWCASTLE, N.B.

EUREKA SHIPBUILDING CO., NORTH HEAD, N.B.

PORT COLBORNE BUILDING & REALTY CO., LTD., REXTON, N.B. (Head Office, Welland, Ont.)

GRANT & HORNE, ST. JOHN, N.B.
Two wooden cargo steamers, "War Fundy" (launched Aug., 1918) and "War Moncton," 250 ft. x 42 ft. 5 in. x 25 ft. 5 in., 1,000 h.p., speed 9½ knots, 2,800 tons d.w., for undisclosed interests.

MARINE CONSTRUCTION CO., CANADA, LTD., ST. JOHN, N.B.

ST. JOHN SHIPBUILDING CO., ST. JOHN, N.B. (Plant at Courtenay Bay.)

ST. MARTIN'S SHIPBUILDING CO., ST. MARTIN'S, N.B.

PETER & A. A. McINTYRE, ST. JOHN, N.B.
One 900-ton schooner under construction.

NEWFOUNDLAND

ANGLO-NEWFOUNDLAND DEVELOPMENT CO., BOTWOOD, NFLD.
Two three-mast aux. schrs., wood, 450 tons, 150 H.P. for the builders' account.

NEWFOUNDLAND SHIPBUILDING CO., HARBOR GRACE, NFLD.
To build ships of 1,200 tons d.w. Steel ships later.

M. E. MARTIN, MORRIS ARM, NR. ST. JOHN'S, NFLD.

UNION SHIPBUILDING CO., ST. JOHN, NFLD.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL, N.S.

NOVA SCOTIA

B. L. TUCKER, BASS RIVER, N.S.

JAS. S. CREELMAN, BASS RIVER, N.S.

HANKINSON SHIPBUILDING CO., BELLIVEAU'S COVE, N.S.
One schooner, 360 tons, wood.

ELI PUBLICOVER, BLANDFORD, N.S.

BRIDGEWATER SHIPPING Co., BRIDGEWATER, N.S.

W. A. NAUGLER, BRIDGEWATER, N.S.

H. MAC ALONEY, CANNING, N.S.

S. M. FIELDS, CAPE D'OR, N.S.
One three-masted schooner, 350 tons.
Keel laid for another three-master.

CHESTER BASIN SHIPBUILDERS, LTD., CHESTER BASIN, N.S.
Two schooners, 100 tons, wood. Launched Aug., 1917, Dec., 1917
One four-masted schooner, 60 tons. Launched Sept., 1918.
One two-masted schooner, 100 tons. Launched June, 1918.

MORTIMER PARSONS, CHEVERIE, N.S.
One wooden three-masted schooner, 170 ft. x 38 ft. x 14 ft., 575 gr. tons, 900 tons cap., for builder's account. Launched Sept., 1918.
Two wooden three-masted schooners for builder's account.
One tern schooner, "Donald Parsons," 140 ft. keel x 34 ft. 4 in. x 12 ft. 4 in., 500 gross tons, 825 tons d.w. for Mortimer Parsons. Launched May 11, 1918.
Another vessel, same size. Launched Nov., 1918, for builder's account.

BAY SHORE SHIPYARD, CHURCH POINT, N.S.
Building two wooden vessels for R. C. Elkin, Ltd., St. John, N.B.

MOISE BELLIVEAU, CHURCH POINT, N.S.
One schooner, 450 tons, wood.

FIDELE BOUDREAU, CHURCH POINT, N.S.
One schooner, 350 tons, wood.

J. E. GASKILL, CHURCH POINT, N.S.
Other yards at Grosses Coques, Little Brook, Meteghan and Port Wade, N.S.
Five wooden schooners from 344 to 387 reg. tons. All sister ships.

COMEAU SHIPBUILDING CO., COMEAUVILLE, N.S.
One three-masted wooden schooner, for builder's account, 450 tons.

J. W. COMEAU, COMEAUVILLE, N.S.
One schooner, 329 tons, Jan., 1918.

J. N. RAFUSE & SONS, CONQUERALL BANKS, DIGBY CO., N.S. (Other plants at Salmon River and Shelburne, N.S.)

E. F. WILLIAMS, DARMOUTH, N.S.

ROBAR BROTHERS, DAYSPRING, N.S.
Schooner for Capt. Ivan Creaser, Dayspring.

MAURICE E. LEARY, DAYSPRING, N.S.
One wooden schooner, 225 tons, 135 ft. o. a. Launched Aug., 1918, for La Have Outfitting Co., La Have, N.S.

J. NEWTON PUGSLEY & CHAS. ROBERTSON, DILIGENT RIVER, N.S.
One schooner, three-masted, 475 tons.

McLEAN & McKAY, ECONOMY, N.S.

S. J. SOLEY, ROX RIVER, N.S.
One schooner, three-masted, 121 ft. keel, 300 tons. Built of native wood. Launched Sept., 1918. For builder's account. For sale.

ALLAN & FRASER, FRASERVILLE, N.S.
One schooner, 350 tons, wood.

BERNARD W. MELANSON, GILBERT'S COVE, N.S.
One three-masted schooner, wood, 250 tons net. Completed November, 1918, for builder's account.

AMOS BLINN, GROSSES COQUES, N.S.
One schooner, 375 tons. Jan., 1918.
One schooner, 350 tons, wood.

BINN BROS., GROSSES COQUES, N.S.

F. K. WARREN & CO., GROSSES COQUES, N.S. (Offices in Union Bank Chambers, Halifax, N.S., also.)
350-ton tern schooner, under construction Jan., 1918.

HALIFAX SHIPBUILDING COMPANY, HALIFAX, N.S.
Building four steamers for Canadian Government. Two of 8,100 tons and two of 10,000 tons. One keel laid January. Also operating dry dock and repair works.

J. WILLARD SMITH, HILLSBURN, N.S. (Head Office, St. John, N.B.)
One tern schooner, wood, 140 ft. keel, 35 ft. beam, 450 tons net reg. tons.

J. W. RAYMOND, LITTLE BROOK, N.S.
Building 500-ton wooden schooners for local owners.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S.
One 800-ton vessel for undisclosed interests. Launch about Dec. 24.

CONRAD & REINHARDT, LUNENBURG, N.S.
"Excellent," 600-ton, launch in January next. Also 175-ton schooner.

J. WILLARD SMITH, HILLSBURN, N.S.
Wooden three-masted schooner. Launch in April, 1919.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
750-ton auxiliary schooner. Completed in January, 1919.

OSMOND O'BRIEN & CO., NOEL, N.S.
"J. Miller," 700 tons. Keel laid April 18. Launched Nov. 20. Completed Nov. 27.

BERNARD & MELANSON, GILBERT'S COVE, N.S.
550-ton vessel for owner's account. Completed Nov. 25.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL
"Mapleland," 1000-ton schooner, fitted with twin Fairbanks-Morse oil engines, 200 horsepower. Complete about Dec. 10. For builder's account.

L. S. CANNING, WARD'S BROOK, N.S.
"W. C. Smith," 700 tons. Completed Dec. 18.

McLEAN & McKAY, ECONOMY, N.S.
"Truro Queen," 750 tons, 15 h.p. engine for hoisting sails and anchor. Completed.

HENRY COVEY, INDIAN HARBOR, N.S.

CHARLES GRIFFIN, ISAACS HARBOR, N.S.
One schooner, 40 tons, wood.

LEWIS SHIPBUILDING CO., LEWISTON, N.S.
One schooner, 670 tons. Jan., 1918.

INNOCENT COMEAU, LITTLE BROOK, N.S.
One three-masted schoner, 140 ft. x 35 ft. 6 in. x 17 ft. 6 in., 650 gr. tons, for the Weymouth Shipping Co., Weymouth, N.S., Can. Delivered Jan. 18, 1918.

J. W. RAYMOND, LITTLE BROOK, N.S.
One wooden schooner, No. 4, 140 ft. x 36 ft. x 17 ft., 575 gr. tons, for Jones Bros., Weymouth, Digby Co., N.S.

H. A. FRANK, LIVERPOOL, N.S.
Two wooden schooners, 500 tons, for builder's account.

McKEAN SHIPBUILDING CO., LIVERPOOL, N.S.

W. F. McKEAN & CO., LIVERPOOL, N.S.
One schooner 400 tons, Jan., 1918.

D. C. MULHALL, LIVERPOOL, N.S.
Two wooden schooners, one 300 gross tons, other 400 gross tons, for undisclosed interests.

ROBIN, JONES & WHITMAN, LIVERPOOL, N.S.
One schooner, 340 tons, wood.

SOUTHERN SALVAGE CO., LIVERPOOL, N.S.

CONRAD & REINHARDT, LUNENBURG, N.S.

LUNENBURG MARINE RAILWAY, LUNENBURG, N.S.

FRED A. ROBAR, LUNENBURG, N.S.

J. B. YOUNG, LUNENBURG, N.S.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.

J. ERNEST & SON, MAHONE BAY, N.S.
One schooner, 520 tons. Jan., 1918.

O. A. HAM, MAHONE BAY, N.S.
One schooner, "Dozle," 128 tons. Launching May 30. One motor boat about 20 tons.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S. (Leased to Montague Mahaffy, Toronto.)
One three-masted schooner, 325 tons gr. reg., 500 tons cap., West Indies freight type. Launched July.
Keel laid for another three-masted schooner with cargo capacity of 425 tons.

JOHN McLEAN & SONS, MAHONE BAY, N.S.
One schooner, 95 tons, wood.

J. A. BALSOM CO., LTD., MARGARETSVILLE, N.S.
One schooner, 409 tons. Jan., 1918.

CLARE SHIPBUILDING CO., METEGHAN RIVER, N.S.
One wooden schooner for builder's account. 400 tons.

A. H. COMEAU & CO., METEGHAN, N.S.
One schooner, 400 tons, wood.

AGAPIT COMEAU, METEGHAN, N.S.

JOHN F. DEVEAU, METEGHAN, N.S.
A 300-ton schooner was launched recently for Ritcey & Co., Lunenburg, N.S., and named Charles A. Ritcey.
1 schooner, 425 tons. Jan., 1918.
1 schooner, 400 tons, wood.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
One wooden sailing schooner, 800 tons d.w. Keel laid April 15th, 1918, to be launched December 17th and completed December 31st. Built for sale.

J. E. GASKILL, CHURCH POINT, N.S.
One wooden schooner, 750 tons d.w. Keel laid March, 1918, to be launched December 15th. Built for J. E. Corkill.

THERIAULT SHIPBUILDING CO.
One wooden vessel, 500 tons d.w. Keel laid September 18th, to be launched in May, 1919. Built for owners account.

SIDNEY ST. C. JONES, WEYMOUTH, N.S.
One tern schooner, "Westway," 450 tons d.w. Keel laid April 18, to be launcheed December 30, 1918, and completed in January, 1919. Built for sale. 130 feet by 28 feet 8 inches beam by 10 feet 6 inches deep.

THE HANKINSON SHIPPING CO., BELLEVEAU'S COVE, N.S.
One vessel, 750 tons d.w. "Charles Doucet," fitted for auxiliary engine. Keel laid April 1, to be launched December 17. One vessel 750 tons d.w. Keel laid Aug., 1918, to be launched April, 1919, and completed. Built for owners account.

FAUQUIER & PORTER, HANTSPORT, N.S.
One vessel 1,800 tons d.w. to be fiitted with two 100 h.p. crude oil engines (Canadian Fairbanks-Morse). Launched December, 1918, and completed January, 1919. Built for sale. Propose to lay keels for two 500-ton, 3-mast schooners as soon as this schooner is launched.

N.S. SHIPBUILDING & TRANSPORTATION CO., LIVERPOOL, N.S.
"Protea," 400 tons d.w., three-masted schooner with provision for Morse semi-Diesel engines. Keel laid Nov. 18. To be completed May account and sold to Pearson & Walker, Cape Town, S.A.
"Gordon T. Tibbs," 400 tons d.w., three-masted schooner. Keel laid Aug. 30. To be launched Dec. 15 and completed Jan. 19. Built for buildeer's account and sold to G. Tibbs & Sons, St. John's, Nfld.
One beam trawler, 900 tons d.w., 400 i.h.p., with two 200 Fairbanks-Morse semi-Diesel engines. Keel laid Nov. 19. To be completed May next. Built for Rafuse Grey et al Le Havre. Repairing schooner Karmoe for N.Y. owners.

H. ELDERKIN & CO., PORT GREVILLE, N.S.
Two vessels, 825 and 500 tons respectively. Keel laid April and August. To be launched December and January. Built for builder's account.

J. E. GASKILL, METEGHAN, N.S.

THOMAS GERMAN, METEGHAN, N.S.
One schooner, 350 tons, wood.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S. (Leased James Cosman's shipyards.)
Building several wooden schooners for own account.

DR. F. H. MACDONALD, METEGHAN, N.S.

METEGHAN RAILWAY & SHIPBUILDING CO., METEGHAN, N.S.
One wooden three-masted schooner, 182 ft. x 35 ft., 450 gr. tons.
One schooner, 470 tons, wood.

CHAS. McNEIL, NEW GLASGOW, N.S.
One wooden 3-masted schooner, 103 ft. x 30 ft. x 10 ft. 9 in., 200 tons, for builder's account. Launched July, 1918.
One wooden 3-masted schooner, 142 ft. x 25 ft. 4 in. x 13 ft., 500 gr tons, for builder's account. Launched Oct., 1918.

THE NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.
Building two 2,800 ton steamers for Dominion Government.

O'BRIEN BROS., NOEL, N.S.
One schooner, 325 tons, wood.

W. R. HUNTLEY & SON, PARRSBORO, N.S.
One wooden schooner, 175 ft. x 39 ft. x 17 ft., 900 gross tons, for

C. T. WHITE & SON, SUSSEX, N.S.

WAGSTAFF & HATFIELD, PARRSBORO, N.S.
One schooner, 400 tons. Jan., 1918.

S. SALTER, PARRSBORO, N.S.

DOWLING & STODDART, PORT CLYDE, N.S.

SWIME BROS., PORT CLYDE, N.S.
Several small motor trawlers, for builder's account.

G. M. COCHRANE, PORT GREVILLE, N.S.

ELLIOTT GRAHAM, PORT GREVILLE, N.S.
One schooner, 360 tons. Jan., 1918.

SMITH CANNING CO., PORT GREVILLE, N.S.
One schooner, 350 tons, wood.

WAGSTAFF & HATFIELD, PORT GREVILLE, N.S.
One schooner, 400 tons, wood.

WILLIAM CROWELL, PORT LATOUR, N.S.

J. W. RAYMOND, PORT MAITLAND, N.S.
One schooner, 375 tons. Jan., 1918.

PORT WADE SHIPBUILDING CO., PORT WADE, N.S. (Head Office, Digby.)
One 350-ton schooner, wood.

JOHN BROWN, PUBLIC LANDING, N.S.
One tow barge, 50 tons, wood.

THE CUMBERLAND SHIPBUILDING CO., PUGWASH, N.S.
Establishing plant for the construction of wooden ships.

MACKENZIE SHIPPING CO., RIVER JOHN, N.S.
One four-masted schooner, 600 tons, wood. About half built. Fitted for aux. engines.

CHARLES McLELLAN, RIVER JOHN, N.S.
One schooner, 100 tons, wood.

W. J. FOLEY, SALMON RIVER, N.S.
Building for J. N. Rafuse & Sons one wooden, 300 tons, under construction. Cap. of plant, 1,000 tons yearly.

J. N. RAFUSE & SONS, SALMON RIVER, N.S. (Other plants at Shelburne and Conquerall Banks.)
Launched recently a three-masted schooner named "Industrial," at W. J. Foley's ship yard at Salmon River, N.S., of the following dimensions: length, 113 ft, breadth, 30 ft., depth, 11½ ft., 325 tons.

ACADIAN SHIPPING CO., SAULNIERVILLE, N.S.
One schooner, 00 tons, wood.

SAULNIERVILLE SHIPBUILDING CO., LTD., SAULNIERVILLE, N.S.

J. LEWIS & SONS, SHEET HARBOR, N.S.
One schooner, wood, four-masted, 725 gr. tons. To be completed Sept.. 1918. For private account.

GEO. A. COX, SHELBURNE, N.S.
One schooner, 200 tons, wood.
One schooner, 322 tons, wood.

JOSEPH McGILL SHIPBUILDING & TRANSPORTATION CO., SHELBURNE, N.S.
"Sparkling Glance," 246 tons register, for Harvey & Co., St. John's, Nfld.
One schooner, 160 tons, wood.

W. C. McKAY & SON, SHELBURNE, N.S.
One wooden schooner, 130 ft. o. a. x 26½ ft. x 11 ft. depth of hold, 140 tons register. Launched Dec. 1, 1917.
One three-masted schooner, for Messrs. Hallet, of Newfoundland.
One schooner, 620 tons, wood.

J. N. RAFUSE & SONS, SHELBURNE, N.S. (Other plants at Salmon River and Conquerall Banks.)

THE SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.

One tern schooner, "Misty Star," 145 ft. x 31 ft. x 11 ft. 6 in., 600 tons d.w., 330 tons gross, for Harvey & Co., St. John's, Newfoundland. Launching Mar. 15, 1918.

One tern schooner, 154 ft. x 32 ft. x 12 ft. 4 in., 400 gr. tons, 700 tons d.w. cap. Launching June, 1918. Not sold yet.

Two schooners, one 349 tons, other 400 tons.

EASTERN SHIPBUILDING CO., SHIP HARBOR, N.S.

One wooden schooner, 600 tons d.w., for J. N. Rafuse & Sons., Halifax, N.S., Can.

One wooden schooner, 300 tons.

STEPHEN MORASH & CO., SHIP HARBOR, N.S.

One wooden schooner, 150 ft. x 37 ft. x 13 ft., four masts, for Canadian interests. Keel laid Feb. 5, 1917.

JAMES E. PETTIS, SPENCER'S ISLAND, N.S.

One schooner, 425 tons, wood, three-masted.

CAPE BRETON SHIPBUILDING CO., SYDNEY, N.S.

THE TUSKET SHIPBUILDING CO., TUSKET, N.S.

AMOS H. STEVENS, TANCOOK, N.S.

ALVIN STEVENS, TANCOOK, N.S.

STANLEY MASON, TANCOOK, N.S.

ALBERT PARSONS, WALTON, N.S.

One schooner, 400 tons. Jan., 1918.

H. T. LeBLANC, WEDGEPORT. N.S.

One steam trawler, 165 ft., 600 tons, for J. N. Rafuse & Sons.

L. S. CANNING, WARDS BROOK, N.S.

One tern schooner, 350 tons, for W. C. Smith & Co., Lunenburg, N.S

WEDGEPORT NAVIGATION & TRANSPORTATION CO., WEDGEPORT, N.S.

T. K. BENTLEY, WEST ADVOCATE, N.S.

One 200-ton steamer.

One 4-masted schooner, wood, 511 tons. To be launched September or October. For owner's account.

J. W. KIRKPATRICK, WEST ADVOCATE, N.S.

One 350-ton schooner, wood.

BOEHNER BROS., WEST LA HAVE, N.S.

Two large fishing schooners, 150 tons each.

One beam trawler, 300 tons, crude oil engines. For local interests.

BEAZLEY BROS., WEYMOUTH, N.S. (Head Office Roy Bldg., Halifax.)

One schooner, 394 tons, three masts.

E. R. GAUDET, WEYMOUTH, N.S.

One 350-ton schooner, three-masted.

E. P. RICE, WEYMOUTH, N.S.

One three-masted schooner, 350 tons.

RICE, WARREN & CO., WEYMOUTH, N.S.

One three-masted schooner, 334 tons.

FALMOUTH SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

One wooden schooner, 350 gr. tons, 700 tons cap., for undisclosed interests.

NOEL SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.

One wooden schooner, three masts, 138 ft. x 35 ft. x 13 ft., 450 net reg. tons. Oil auxiliary engines. Launching August, 1918, for builder's account.

C. A. NICKERSON, WOODS HARBOR, N.S.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.

Taken over and enlarging old plant of James Jenkins.

350-ton schooner building.

W. O. SWEENY, YARMOUTH, N.S.

100-ton fishing schooner.

YARMOUTH SHIPBUILDING CO., YARMOUTH, N.S.

One 450-ton wooden schooner, 128 ft. keel. To be completed Oct., 1918.

ONTARIO

CANADIAN ALLIS-CHALMERS LTD., BRIDGEBURG.

Four 3,500-ton steamers for I.M.B.; one launched, one ready to launch.

COLLINGWOOD SHIPBUILDING COMPANY, COLLINGWOOD, ONT.

"Canadian Warrior" completed. Three steel steamers on berths.

R. MORRILL, COLLINGWOOD, ONT.

"Windsor," Aug. 10, steam tug, 105 ft., for Ontario Gravel & Freighting Co.

CANADIAN CAR & FOUNDRY CO., FORT WILLIAM.

No present contracts.

GREAT LAKES DREDGING CO., FORT WILLIAM.

No present contracts.

THUNDER BAY CONTRACTING CO., FORT WILLIAM, ONT.

One wooden freight steamer, 261 ft. long, for undisclosed interests.

NATIONAL SHIPBUILDING COMPANY, GODERICH.

Building marine engines and boilers.

COLLINGWOOD SHIPBUILDING COMPANY, KINGSTON, ONT.

Building 3,500 ton steamer for Canadian Government.

DAVIS DRY DOCK CO., KINGSTON, ONT.

Building steel lifeboats.

GEORGIAN BAY SHIPBUILDING & WRECKING CO., MIDLAND.

Repairing several wooden tugs.

MIDLAND SHIPBUILDING CO., MIDLAND, ONT.

Two steel steamers for Imperial Munitions Board.

MIDLAND DRY DOCK CO., MIDLAND, ONT.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONT.

Building six ships for the Canadian Government and six trawlers.

MUIR BROS.' DRYDOCK, PORT DALHOUSIE.

Repairing the wooden freight steamer "Windsor."

J. W. GEROW, ROSSPORT, ONT.

REID WRECKING CO., SARNIA, ONT.

DOMINION SHIPBUILDING CO., TORONTO, ONT.

Building six steel steamers, 3,500 tons, for undisclosed interests.

POLSON IRON WORKS, TORONTO, ONT.

"War Timiskaming" launching in February. Three steel steamers on stocks. "War Hamilton" completed and ready for sea.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONTARIO

TORONTO SHIPBUILDING CO., LTD., TORONTO, ONT. (Toronto Dry Dock Co., Ltd., under same management.)

BRITISH AMERICAN SHIPBUILDING CO., WELLAND.

"War Weasel" delivered; "War Badger" completed; 2 steamers for Canadian Government, 4,300 tons each.

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R. N. LE BLANC, BONAVENTURE, QUE.

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THE DAVEY SHIPBUILDING COMPANY, LAUZON, QUEBEC

Building fifteen wooden vessels of 1,500 tons for French Government. Two 5,100 ton steamers for Canadian Government. One keel laid. Operating Champlain Dry Dock. Building extensive new machine shops. Building six trawlers for Department of Naval Service.

ATLAS CEMENT CONSTRUCTION CO., LTD., MONTREAL, QUE.

CANADIAN VICKERS, LIMITED

Building five 8,100 ton steamers for Canadian Government. One 4,450 ton steamer for Canadian Government. One 8,300 ton steamer for French Government.

FRASER BRACE & CO., MONTREAL.

Eight wooden steamers for French Government, 1,500 tons each.

Four 5,100-ton steamers for Canadian Government.

—British Columbia— tc|Ex5d(E2 shrdlu shrdl b

HALL ENGINEERING CO., MONTREAL, QUE.

MONTREAL DRY DOCK & SHIP REPAIRING CO., MONTREAL, QUE.

Operate dock 428 ft. long 30 ft. deep.

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THE QUEBEC SHIPBUILDING AND REPAIR CO., Board of Trade Bldg., MONTREAL, QUE.

2 vessels for undisclosed interests 3,000 tons each.

QUINLAN & ROBERTSON, MONTREAL, QUE. (Yards at Quebec.)

Four wooden steamers, for undisclosed interests.

LOUIS GAUNDRY, 12 St. Peter St., QUEBEC, QUE.

QUEBEC SHIPBUILDING & REPAIR CO., ST. LAURENT, QUE.

2 schrs. 1,400 tons and 1,200 tons.

One wooden four-masted auxl. schooner "Martin Connolly," 223 ft. x 42 ft. x 20 ft., 2,100 tons d. w., for undisclosed interests. Launched Oct. 28, 1917.

QUINLAN & ROBERTSON, QUEBEC, QUE.

Four wooden steamers, totalling 6,400 tons, for undisclosed interests.

CANADIAN GOVERNMENT SHIPYARDS, SOREL, QUE.

One steel vessel for undisclosed interests.

H. H. SHEPHERD, SOREL, QUE.

Rebuilding seven drifters. Particulars withheld owing to govt. restrictions.

SINCENNES-McNAUGHTON LINES. SOREL, QUE.

One tug 410 tons, wood.

CAN. GOVERNMENT SHIPYARD, SOREL, QUE.

One steel vessel for undisclosed interests.

Building steam trawlers and wooden drifters for undisclosed interests.

LECLAIRE SHIPBUILDING CO., SOREL, QUE.

Six steel trawlers 125 feet long with single screw triple expansion engines, 500 i.h.p. Two of these launched in November. One more to be launched before ice comes in. Six wooden auxiliary schooners fitted with twin screw "Skandia" engines of 120 h.p. each. These will be all in frame at the end of November and four ready for launching as soon as ice is clear next spring.

NATIONAL SHIPBUILDING CORPORATION, THREE RIVERS, QUE.

"War Mingan" and "War Radnor," launched Oct. 15 and No. 2. Built for the Imperial Munitions Board and will be operated by Anning Bros., Cardiff, Wales. Now building 10 self-propelling barges for France.

W-S-M

The Wellman-Seaver-Morgan Company has arranged to have The Canadian Fairbanks-Morse Company, Limited, represent it exclusively in the sale of its products in Canada.

Mr. A. E. Johnson, a former W-S-M Engineer, has headquarters in the Montreal Office of The Canadian Fairbanks-Morse Company, Limited. He will give his personal attention to all communications relative to the various lines manufactured by The Wellman-Seaver-Morgan Company.

For the greater convenience of those located outside of the Montreal District, communications may be sent to Branch Offices at Quebec, St. John, N.B., Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver or Victoria.



W-S-M Products

Coal and Ore Handling Machinery,
Special Cranes,
Hoisting and Mining Machinery,
Steel Works Equipment
Coke Oven Machinery
Rubber Machinery,
Port and Terminal Equipment,
Hydraulic Turbines.

MARINE NEWS FROM EVERY SOURCE

Toronto.—The launching of the General Turner was attended by a Masonic organization in full regalia, the sponsor being the wife of the Illustrious Potentate, Rameses Temple, Mystic Shrine. The Shriners attended in full regalia, with their band, and made quite a dash of color in the prosaic shipyard.

The vessel is a sister ship to the General Currie and General Morrison, recently launched, and is of full canal size, 261 feet by 43 feet 6 inches by 27 feet 6 inches deep. The usual triple expansion engines and Scotch marine boilers are fitted.

Montreal. — The Canada Steamship Lines, Ltd., have arranged. in conjunction with the Compagnie Generale Trans-Atlantique, for a service between Montreal and French ports. This, it is hoped is but the beginning of a foreign trade that will carry the Canadian flag to all parts of the world.

Montreal.—The Houston Lines are inaugurating a service between Canada and Argentine. The first sailing will be by the Alan Keith, from Montreal, about May 5. This will be followed by monthly sailings, St. John, N.B., being the winter port. This will be of great benefit to Canadian shippers, who have hitherto been compelled to ship their merchandise via New York.

Quebec.—Officials of the Canadian Pacific Ocean Services, at a conference with Mayor Lavigueur, held recently, stated that if the scale of wages decided on by ship laborers was carried through, they would have to abandon their intention of making Quebec their summer port for all their vessels. The ship laborers are demanding 60 cents an hour for an eight hour day, 90 cents an hour for overtime, and $1.20 for all Sunday work.

Bridgeburg., Ont.—The two vessels remaining to complete the contract for four steamers at the Canadian Allis-Chalmers Co., have been commenced. One has been launched and the second one is ready to launch. One drawback has been the lack of housing accommodation in the vicinity of the yards. The city council has decided to appeal to the Ontario Housing Committee for aid to local families in order to erect suitable dwellings.

Liverpool, N.S.—The Nova Scotia Shipbuilding & Transportation Co., Ltd., of Liverpool, N.S., had another successful event, when the schooner "Faustina," built for J. F. Creaser Co., Ltd., of La Have, and John Penny of Newfoundland, was launched, J. S. Gardner being the master builder. The dimensions are, net tonnage 150, length over all 117 ft., breadth 26 ft., depth of hold 12 ft. 6 in. The keel of this boat was laid down in January and the construction has been rapidly gone on with owing to the mildness of the winter and no loss of time. The above company are now busy upon two beam trawlers and are laying a keel for a 200-ton, three-mast schooner upon the same spot as where to-day's launching took place.

Toronto.—The board of control received a letter from A. C. McMaster, secretary of the Dominion Shipbuilding Company, stating that the Government had decided against granting any contracts to the company for ships. Contracts for two ships were wanted and very large financing had been arranged in the country. "They have as much right to take up the shipbuilding as these old debt-ridden junk railways," said Con. McBride of the Government. Mayor Church was authorized to again take up the matter with the Government, Board of Trade and Harbor Commission.

Toronto.—The "War Toronto," one of the fleet of forty-six wooden war freighters being built at different points in Canada, steamed out into the lake on her trial trip. It is just seven months since the freighter was launched, and it is expected that she will be on her way to England before long to take part in coastwise trade. She was built by the Toronto Shipbuilding Company, and her successful trial closes the "war boat" programme of that company. She is a 3,000-ton boat, built to the maximum canal size of 260 feet length and 42-breadth beam. Like her sister boat, "War Ontario," she has proved in every way satisfactory to her builders. She was built on exactly the same lines as the "War Ontario," and as the latter boat has proved seaworthy in bad gales the "War Toronto" will easily make the trip to England.

Fatal Explosion.—A fatal explosion took place recently on one of the boats of the Dominion Coal Company, when the bottom blew out of one of the combustion chambers of one of the boilers, resulting in the death of five of the crew, Chief Engineer C. B. McArthur. Second Engineer W. Scott, K. McDonald and two Chinese firemen, and likewise injuring the third engineer, M. Campbell, and two Chinamen.

Victoria.—The mechanical equipment of the Cholberg yards has been increased by the addition of a new steam driven air compressor, and a large increase in the pipe line is contemplated.

Victoria.—A company has been formed, with a capital of $100,000, to build and equip a floating drydock, and to build tugs and small craft. A thoroughly modern machine shop is to be erected, and the company will specialize in repair work.

Montreal.—Among shipping on the St. Lawrence this season there will be many vessels of the United States Shipping Board Emergency Fleet Corporation. Within a fortnight after the opening of navigation there will be a fleet of 98 ships coming down from the Great Lakes. Altogether there will be 300 ships completed this summer, which will come down from such ports as Duluth, South Chicago, Saginaw, Detroit, Toledo, Cleveland, Manitowoc, Lorain, and Buffalo.

Repairs to Canal.—The Lachine Canal is now empty for the annual spring cleaning and repairs. Owing to the heavy traffic of last year considerable repairing has been necessary, but owing to the short time at the disposal of the commissioners, due to the early opening of navigation, the work will require to be hurried, and much will require to remain undone for another year. The free movement of the ice this year has prevented any serious jamming, and lock gates and bridges are consequently in good condition. It is expected that the water will be admitted about the 15th.

Montreal, Que.—The Anderson Co., of Beaver Hall Hill, have closed an important contract with the British Government, for the purchase of steam trawlers and wooden drifters from the latter. The contract involves about 150 vessels, and $10,000,000, about 100 of these vessels having been built in Canada. These were built for the Imperial Ministry of Shipping, and were mostly for use as mine sweepers. Since the cessation of hostilities there has been a brisk demand for fishing vessels, and these craft are very suitable for deep sea fishing. The vessels are now lying at Halifax, and will probably be disposed of from that port. Enquiries have been received for these vessels from the French, Dutch and even the British Government, while the Government of the Philippine Islands has bought six.

Nine Points of Superiority

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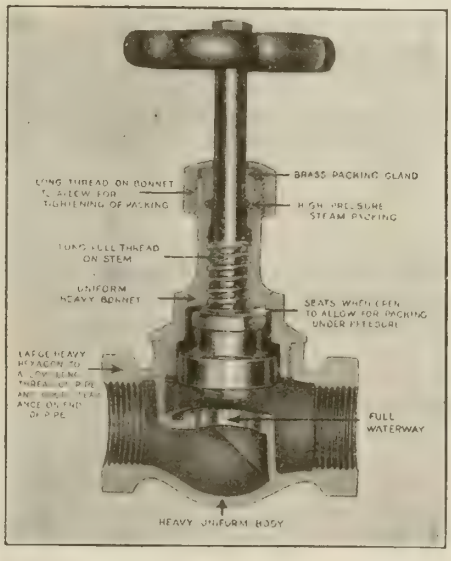
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LONDON and TORONTO, CANADA

DISCUSSION OF PAPER ON BOILER HEATING SURFACE

The Chairman: I am sure we have all listened with attention to the excellent paper we have had from Mr. Wells. The whole subject bristles with information to all engineers, and I hope that some of the members present will lose no time in making some remarks.

Mr. R. Balfour: I endorse the Chairman's remarks. Although it is a short paper, there is ample matter for discussion, particularly as it touches upon fuel combustion, and in this connection I would commend to the members a most interesting lecture by Mr. David Wilson, Technical Adviser to the Coal Controller, delivered at St. Bride's Institute, and published in "Engineering," October 18th, 1918. At no time in our history has there been greater need for studying the economy of fuel than now. I would rather defer further remarks and communicate them by correspondence, meantime thanking the author for his interesting contribution.

In further commenting on Mr. Wells' paper, Mr. R. Balfour added, by correspondence: Many important points arise from thinking over this interesting paper, but I must confine myself in my observations mainly to the efficiency of the fuel consumption.

The author has thought fit to make his comparison between boilers of the Lancashire and locomotive type respectively, and whilst the marine type would probably have been more to the taste of the members present, no doubt he had his own reasons for offering the figures, which we find no less interesting as a basis for discussion.

An important point at once manifest is that in spite of the wide difference in the ratio of heating surface to grate area, wherein the locomotive type has the apparent advantage of 46 per cent., the efficiencies are nearly equal. Is this not due to the fact that the Lancashire is fully clothed in insulations? i.e., by the brickwork setting and the upper surface with the usual covering, whereas the locomotive type is necessarily deficient in this protection.

The particulars of the experiments on the locomotive boiler where the restricted heating surface is compared with the full surface to the advantage of the former, is of the utmost interest, and to my mind therein lies the key to the cause of the inefficiencies of fuel combustion.

Whilst agreeing with the author in all he says as to the "scrubbing" of the gases on the surface of the tubes, is not the real reason of the equal and ever increased efficiency shown by this test to the boiler with half its surface throttled, due more to the reduction of the actual volume of the gases passing through the boiler, or, in other words, the reduction of the excess air that finds its way into a furnace where no restriction is offered to the volume of air supply for combustion? And this raises an important point which should be taken up by some of the members of the Institute—namely, a close investigation into the regulation of the proper air supply to suit the given amount and quality of fuel it is desired to consume on any given furnace.

In connection with this I hope due consideration will be given to the employment of pyrometers, CO_2 Recorders or analysers, draught gauges and ashes, without which no useful data can be obtained. It should be the prime duty of all engineers in charge of steam boilers of any kind to eliminate all air other than that actually required for the practical combustion of the fuel—excess air may be termed the "Kaiser" of the boiler, and if 10/11 lbs. air is only consumed in the chemical combustion of 1 lb. coal, why should we allow sometimes 2/3 times this quantity free access to the furnace?

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Arrangements will be made to have samples on exhibition at places throughout Canada; specifications, full details, and tender forms will be mailed when ready to those who have registered as suggested above.

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Dominion, Provincial and Municipal departments, hospitals, charitable, philanthropic, and similar institutions which are conducted for the benefit of the public and not for profit may purchase goods without tender at prices established by the War Purchasing Commission.

All communications should be addressed to the Secretary, War Purchasing Commission, Booth Building, Ottawa, who will be glad to supply lists and further details to those interested.

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(4) It will see that legislation is passed in the House of Commons, which will insure the safety of public life and property afloat.

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The only means we can ever have to secure and maintain the international power and prestige necessary to the existence of ourselves and children.

Join this institution and do not hesitate—do it now.

The Canadian Merchant Service Guild is under the supervision and control of the masters and officers of our mercantile marine, and all the citizens are invited to help in this great work.

W. INKSTER, Sec.,
Box 840, Collingwood, Ont.

Collingwood, Ont., April, 1919

Dear Sir:—

The management committee of the above named Institution wish to inform you that this ship named the Canadian Merchant Service Guild, whose duties are to watch over and protect the interests of those who man our merchant ships, is now ready with her decks cleared for action. The look-out is in the crow's-nest with his telescope in hand, the master and officers are at their posts, and so she lays at her anchors awaiting her crew, and without your co-operation, she must lay there until her cables rot and she is dashed on the breakers and destroyed; therefore, may we ask you if not already a member to fill out the attached application form, returning it with your remittance, and where possible, use your influence to enlist the aid and support of our brother masters, officers, pilots and seamen, together with all those interested in building up the trade and commerce of Canada, so that she may start out with the numbers and unity on her decks necessary to produce the finance required. And with your co-operation in this way, no storm that ever blew will cause her destruction, and the duties she has taken upon herself to perform shall be accomplished even though we have to travel through that fiery furnace of perdition to secure their success. And so in this way ourselves and our profession will be drawn out of the Slough of Despond into which we have surely inadvertently and, therefore, unwillingly dropped, and with the numbers and unity on her decks, and the finance necessary under her hatches, the thunder of her guns shall be heard throughout the whole Dominion of Canada and she shall arrive at her destination with the word "Victory" written on her bows in letters of gold.

Is it not your duty as a seaman and a Canadian to get on board, sign articles, and assist this vessel to her destination?

Yours fraternally,
CAPT. W. INKSTER,
Sec'y-Treas.

.....

APPLICATION FORM

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To the Secretary of The Canadian Merchant Service Guild, Collingwood, Ont.:—

I wish to be enrolled as a Member of the Guild. Herewith is my first subscription. Please send receipt by return post.

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Amount $..... *Date*.....*19*

Subscriptions, including legal defence, is $10 for captains; $8 for mates and pilots; $6 for wheelsmen, and without legal assistance $7 for captains; $5 for mates and pilots; $4 for wheelsmen. Any of these members who may not be actively engaged at their professional duties during the season of navigation will be required to pay $3 per year to retain his membership. Associate members will be required to pay $2 per year, and may consist of any British subject domiciled in Canada interested in the safety and prosperity of our trade and commerce with the outside world.

These subscriptions will become due the first day of the month in each year in which the member joins.

given to the value of the analysis of flue gases. The existence of 20 per cent. of CO_2 gives ideal conditions or complete combustion, but for practical purposes we must leave this out of the question. However, an attempt to obtain the next best should be made.

The following figures may be taken as the approximate position of affairs:
20 per cent. CO_2..Complete Combustion
16 per cent. CO_2..10 per cent. of fuel lost
12 per cent. CO_2..15 per cent. of fuel lost
9 per cent. CO_2..20 per cent. of fuel lost
6 per cent. CO_2..30 per cent. of fuel lost
4 per cent. CO_2..45 per cent. of fuel lost

If a test or series of tests could be made we would doubtless realize the great waste of fuel.

Mr. B. P. Phelden: I share Mr. Balfour's views. I should have felt more at home if Mr. Wells had dealt with marine boilers rather than locomotive.

I do not know whether the author assumes that the Committee that are settling the size of safety valves are settling the size for locomotive or Lancashire boilers. I happen to be one of the members representing the Institute of Marine Engineers on the committee to which Mr. Wells referred, "The British Marine Engineering Design and Construction Committee," and they have recommended the formula, which Mr. Wells gives in his paper, for the size of safety valves, but so far they have only dealt with marine boilers of the tank type. Up to the time this committee met the size of safety valves was settled by the area of fire grate. The fire grate is a very variable quantity, and there is nothing definite about it; it can be increased or decreased, and it is a variable quantity, which, in my opinion, we ought not to have in an engineering formula if we can have something better.

The committee took the view that the most satisfactory way of settling the size of safety valves would be to base it on something which could not be altered, and that was heating surface.

The Board of Trade have had very many years' experience of safety valves, and so have Lloyds and the other Registration Societies, and their experience was placed before the committee.

The safety valve, as the name implies, has to be fitted for safety purposes, and we do not want to cut down this size to the lowest limit.

If one has to settle the size of the safety valve on the efficiency of a boiler, what does that amount to? The shipbuilder has to order his safety valves when building the ship, and cannot wait until the efficiency of the boiler is discovered. Then, again, as regards fixing the size by the amount of fuel burnt, we have now arrived at a stage where we burn oil as well as coal; some ships start off on a voyage and burn coal part of the way and then change to oil. What is the fire grate area in that case?

The figures given in the paper are very interesting, but are more than I can tackle now, and I do not propose to offer many criticisms. I will just make this general statement, that the coal burnt per square foot of fire grate according to the figures given is a constant quality coal; we have not a constant quality coal—we are given all kinds of coal, good and bad, and this also applies to oil.

Both coal and oil vary in different parts of the world in calorific value, and the sizes of safety valves have to be arranged to suit all conditions. They are very similar to other things fitted into a ship, viz., approximations to suit different circumstances.

The Board of Trade fixed their sizes of safety valves from the results of accumulation tests; the stop valves of the boilers were shut down and the fires were continued to be forced and the safety valves had to be a sufficient size to prevent an accumulation of pressure beyond 10 per cent. The accumulation test is rather a hard test on safety valves, as it is not likely that a boiler in the ordinary way would be worked under such conditions, but on the other hand it is a safe test, and provides against extraordinary things happening.

With regard to retarders, I think most of us have been using these for years, and I think Mr. Wells will agree with me when I say the area through the tubes in most boilers is much larger than it need be. Some boiler designers, when high power is wanted on light weight of boiler, put in a fairly large proportion of the heating surface as tubes. By plugging up some of the area of the tubes and fitting retarders in them an advantage is gained in two directions, firstly by shutting off part of the unnecessary area, and secondly, by having the heat travel round a spiral so that the heat is deflected against the metal of the tubes.

I have tried different types of retarders, but found the best to be those which were made of twisted steel about two-thirds the length of the tube. If the retarders are kept too close to the combustion chamber they are apt to choke the tube if the latter leaks at all.

Mr. W. McLaren: I certainly have to thank the author for his paper. With regard to the safety valve question, no matter what class of boiler it is, in my opinion that boiler should be tested with the best quality of coal and not allowed to pass the examination until put under a test at the hardest firing, and when it gets up to the estimated pressure, that of safety, it should then blow off; and when dampers are shut and everything closed up, it may still blow off steam and be quite safe. The extra amount of steam should be gone in the very shortest time, I think in somewhere about 10 to 20 seconds. But when we get into port under certain conditions a hullabaloo goes up from the valves, we cannot hear one another, neither can the skipper hear the calls from the shore on the ship for the steam blowing off. That may repeat itself from time to time for, say, fifteen minutes. Then we have been presented with the locomotive and the Lancashire types. No matter what the kind of boiler, if you put four tubes into the heating surface, no amount of comparison will determine what the boiler might return in evaporating the water into steam, as it is the amount of heating surface you can get into it, and the freedom that the gases may have to circulate, with the scouring action that the author of the Paper speaks of—that is the secret of tube efficiency. I understand that the retarders in the spiral condition give the best efficiency, no doubt they found that out and put these retarders in the tubes, because they got the best condition. In the locomotive boiler we have all the tubes in it, and the size of the furnaces with a good depth from the furnace tube crowns of fire box to the fire bar level, which I think we neglect to consider. You can have a certain amount of grate area, but that might be at the crown of the fire box, or half way down, or wherever it may be placed. There is some sufficient distance from the heating surface to a fire grate that gives the best effect.

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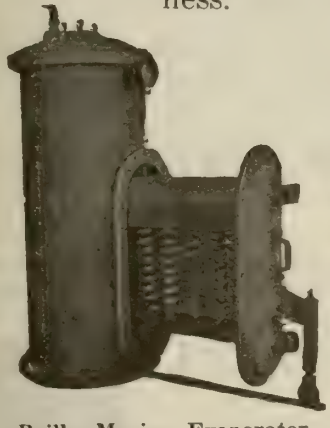
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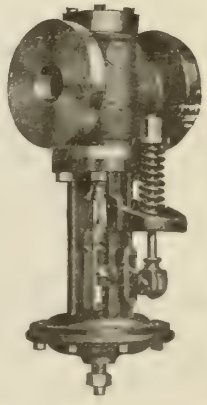


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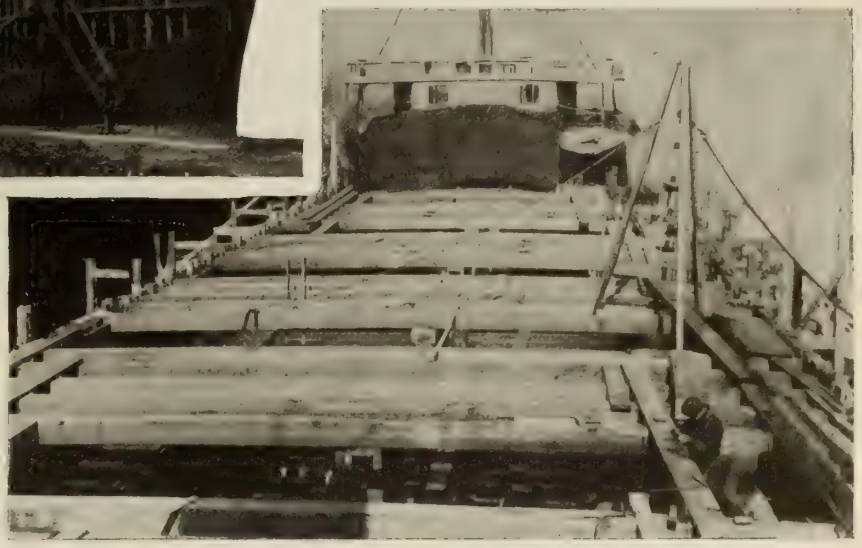


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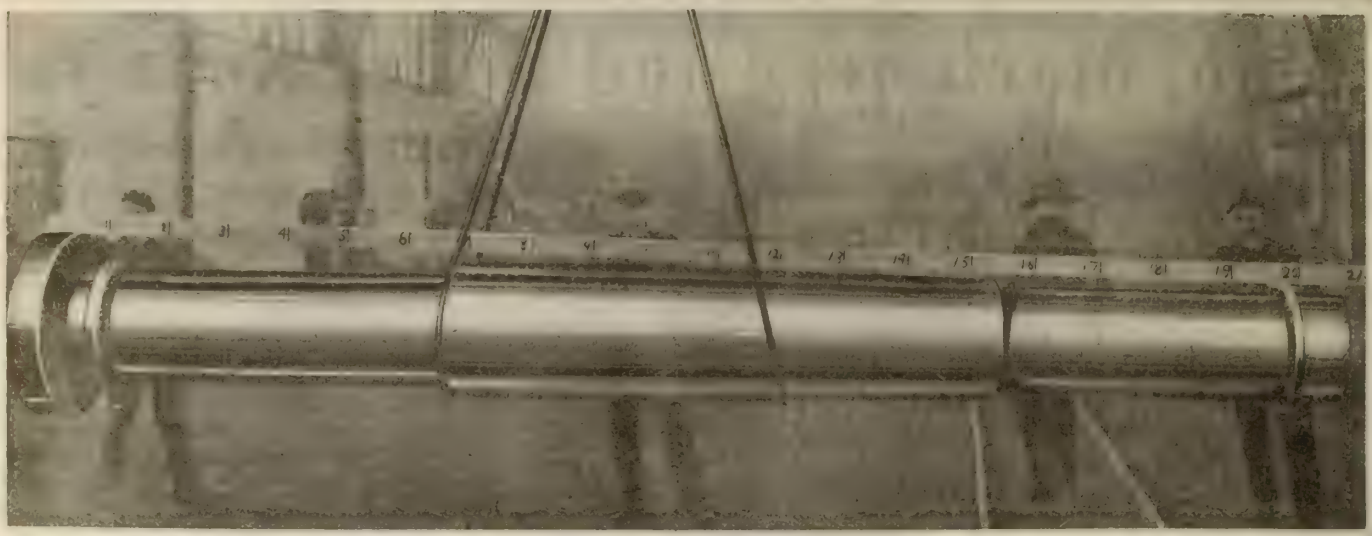
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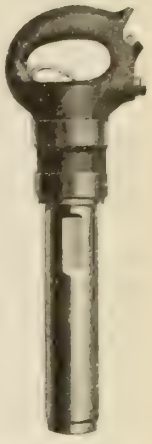
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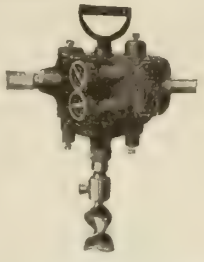
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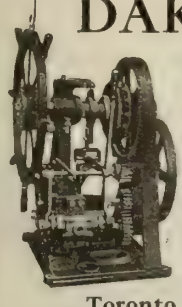
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This situation, according to J. W. Dafoe in the May issue of MACLEAN'S MAGAZINE, explains much that has developed at Versailles. Further, it contains the promise of a close *rapprochement* between the two great English-speaking democracies for all time to come.

Mr. Dafoe has contributed a remarkably interesting article to this number of MACLEAN'S, lifting the curtain on many of the puzzling situations that have arisen overseas. As the editor of the Manitoba *Free Press*, he is the dean of Canadian newspapermen; as the representative of the department of Public Information on the Canadian Mission to the Peace Conference, he was in a special position to learn what was transpiring. He tells of the really big part that Canada has played in the Proceedings and points out that Canada's status as a nation was firmly established in the eyes of the world when she was allowed separate representation.

A Dozen Other Features---Nationally Important

This May issue is full of articles of unusual significance for Canadian readers.

"SOLVING THE PROBLEM OF THE ARCTIC"
—By Vilhjalmur Stefansson

The second instalment of his remarkable story of the four years of exploration that he undertook for the Canadian Government in the region of the "Pole of Inaccessibility"—a harder place to reach than the North Pole.

"ORGANIZING FOR PEACE"
—By George Pearson

An article of the Great War Veterans' Association by a well-known author-soldier.

"THE CANADIANS IN SIBERIA"
—By Capt. W. E. Dunham

A graphic story of what our forces did in combatting the Bolsheviki, by an officer who has just returned.

"SAFE IN THE SADDLE"
—By J. K. Munro

A review of affairs at Ottawa in which the opinion is expressed that Union Government for the time being is safely entrenched.

The National Idea

The articles in this issue of MACLEAN'S reflect the national idea—Canada's part in the Peace Conference, the political situation at Ottawa, the exclusive report of Stefansson's national explorations, the national organization of our returned men, the work of our forces in Siberia. The reader of MACLEAN'S gets a broad idea of what Canada as a whole is doing. The value of this issue— and of all issues —is very great, therefore, from an educational standpoint.
MACLEAN'S is the one magazine that should be selected for young Canadians to read.

Four capital stories by famous authors—W. A. Fraser, Lloyd Osborne, Frederic S. Isham and C. W. Stephens.

The Review of Reviews

An unusually fine array of articles is given in this department, selected from the best in magazines and periodicals the world over. Some of the titles are:

Planned to Destroy British Fleet.
How Mackensen Was Caught.
Events of War Foretold by Stars.
What is Life Like Beyond the Grave?
A High-born Bolshevik.
The New Life in Dry America.
Germans Were Ready to Capitulate.
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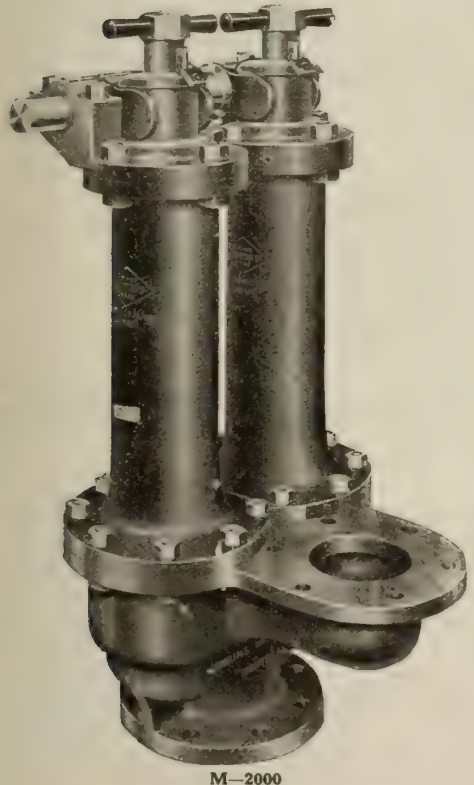
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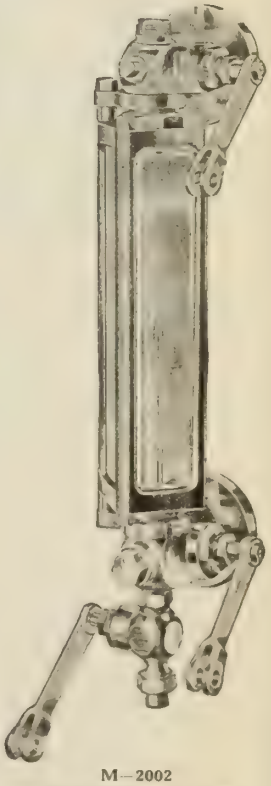
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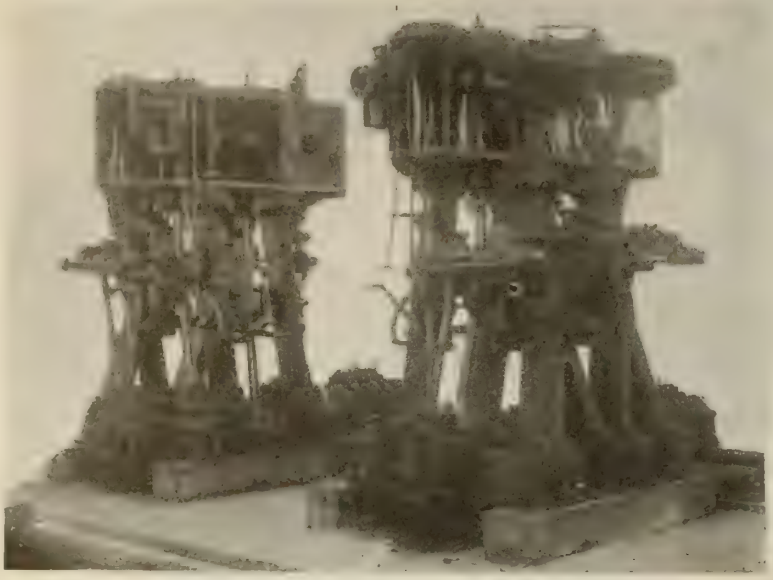
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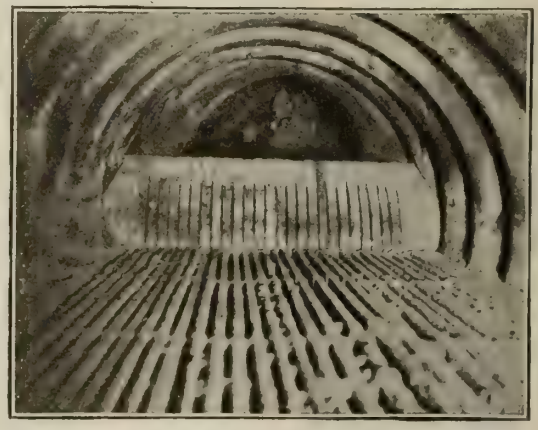
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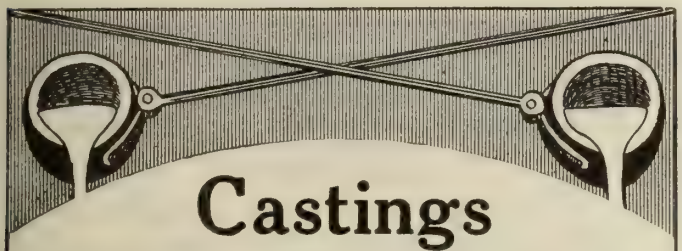
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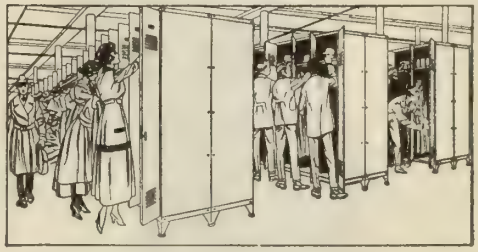
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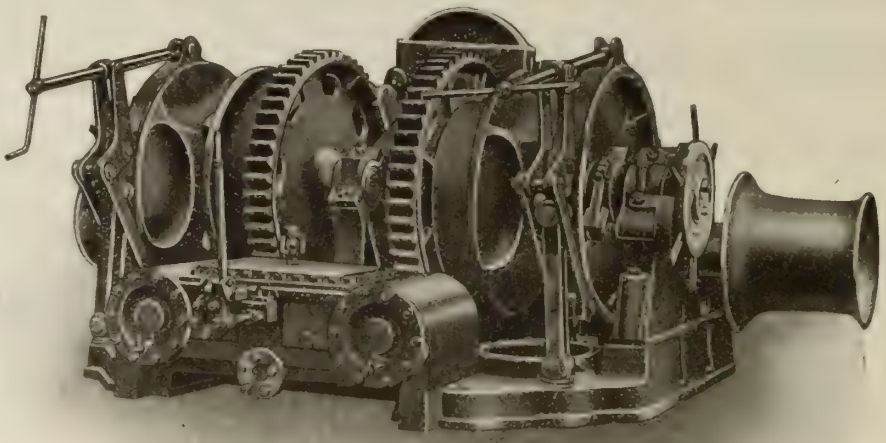
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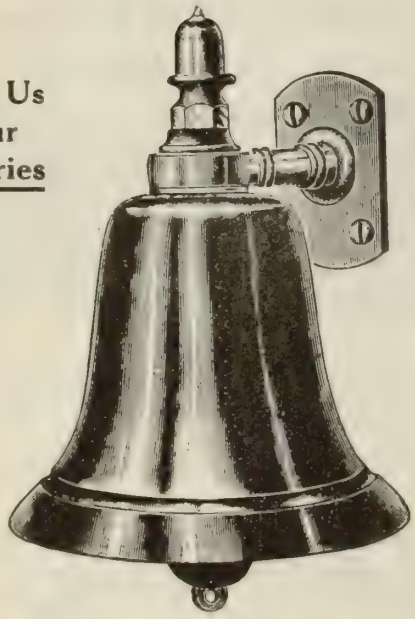
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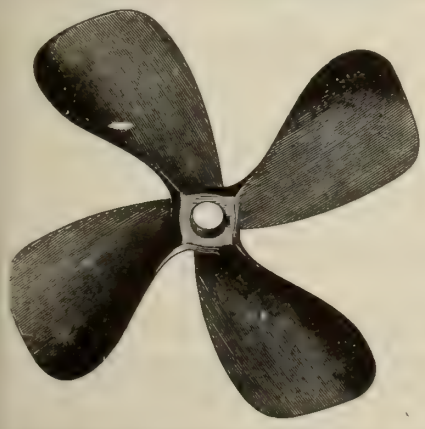
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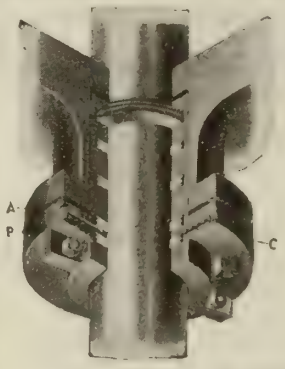
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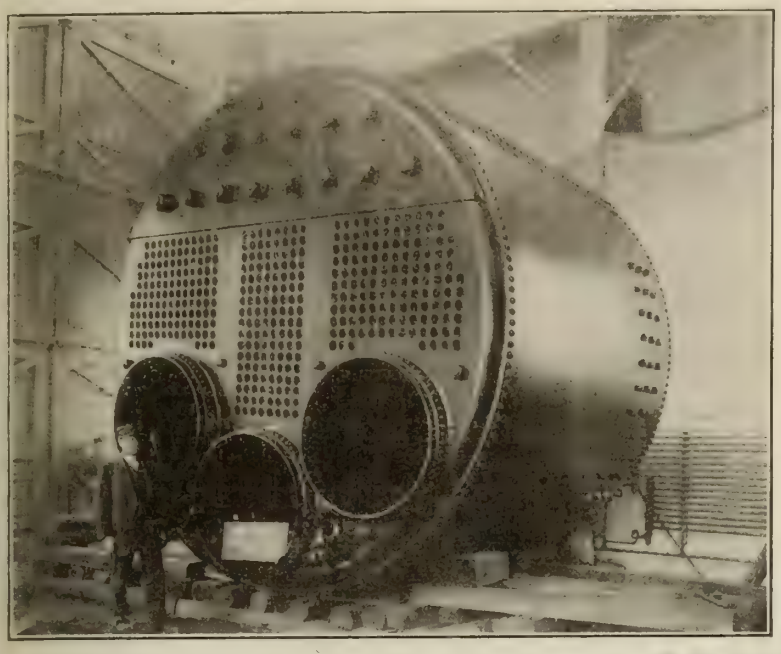
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Do High Prices of Machine Tools Hinder Sales?

THE question asked of a considerable dealer in Toronto by THE FINANCIAL POST is answered by him in THE POST of March 8th, in part, as follows:

> "New lists that are coming out do not show concessions in prices. As long as firms can sell at the present prices there is not much chance for a lower level of values."

The rest of that article in THE POST is interesting, and here are some other extracts worth noting from POST items of this week:

Implement Manufacturers May Unite for Export Trade

"Representatives of the implement manufacturers have been at Ottawa in consultation with the Canadian Trade Commission to arrange for the pushing of their export business. What is likely to be proposed to them is that they should work in concert, and their orders abroad should be placed through a central selling body, the expenses of conducting which should be maintained by a pro rata tax on each member of the association. They will provide their own credits from a common fund, which can be created by contributions gauged according to the respective interests involved."

Steel Market Is Still Unsettled

Big American Interests Co-operating in Secretary Redfield's Plan

The talk of lower prices for steel continues in the market. It is a fact that the "set prices" of the war period have, in many ways, spoiled the trade for what has followed. When prices were fixed, buyers and sellers knew their ground for the coming three months. Not only so, but they were quite certain that when changes would be made they would not be radical, and would be in keeping with the cost of material and labor entering into the output.

Last week a number of prominent steel producers were meeting in New York, and according to the authorized version they "discovered" that George N. Peek, recently named by Secretary Redfield as chairman of "The Industrial Board of the Department of Commerce" was in town, and accordingly they invited him in to explain Secretary Redfield's plan for the deflation of war-time prices. Indications are that the steel producers are going to make a show of resisting the movement, but will gracefully yield at the last moment.—"The Financial Post," March 8, 1919.

Above is part of a front-page news item in THE POST of March 8th.

Latest Activities of Steel and Iron Using Interests

Stove Manufacturers Out For Export Trade

"The Canadian stove and enamelled ware manufacturers are making an aggressive effort to develop export business and to secure orders from Europe, Australia, New Zealand and South Africa. A. M. Smith, sales manager of the McClary Manufacturing Company, will, on behalf of the manufacturers, make a personal investigation of European prospects."

New Ship Repair Plant For Vancouver

"Seattle men propose to build at Vancouver, B.C., a steel dock of 25,000 tons, capable of handling the largest ships which make the Port of Vancouver. Embraced in the enterprise will be a shipbuilding and repair plant, the whole to cost in the neighborhood of $4,000,000."

New Iron Industries For Border Cities

"Plans are being made for the location of a large malleable iron corporation with extensive connections in the United States, on the Windsor industrial site. Negotiations to this end have been pending for considerable time. Altogether, 12 large manufacturing firms with headquarters across the border are negotiating for sites in the Border Cities."

Business Building News Items Appear Each Week in *The Financial Post*

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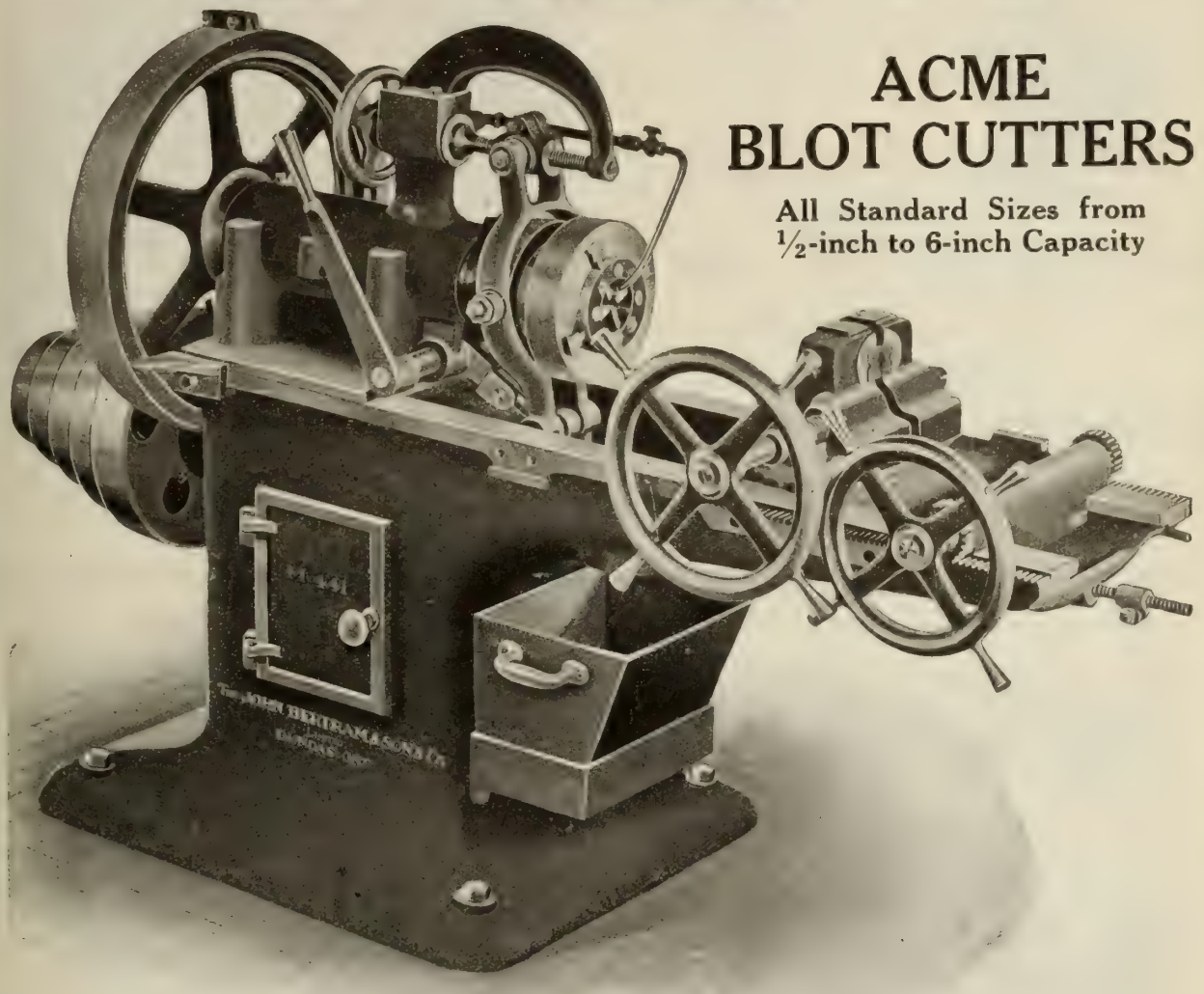
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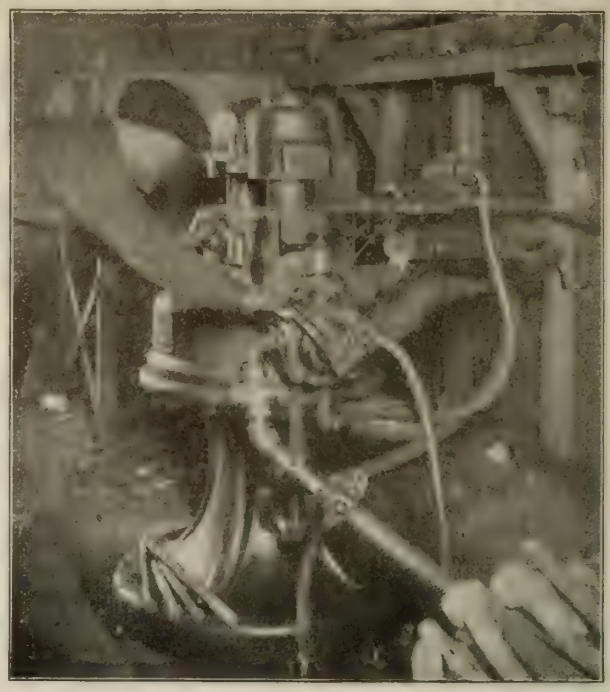
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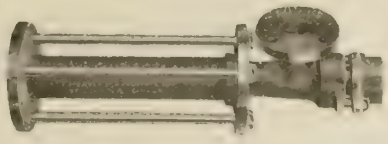
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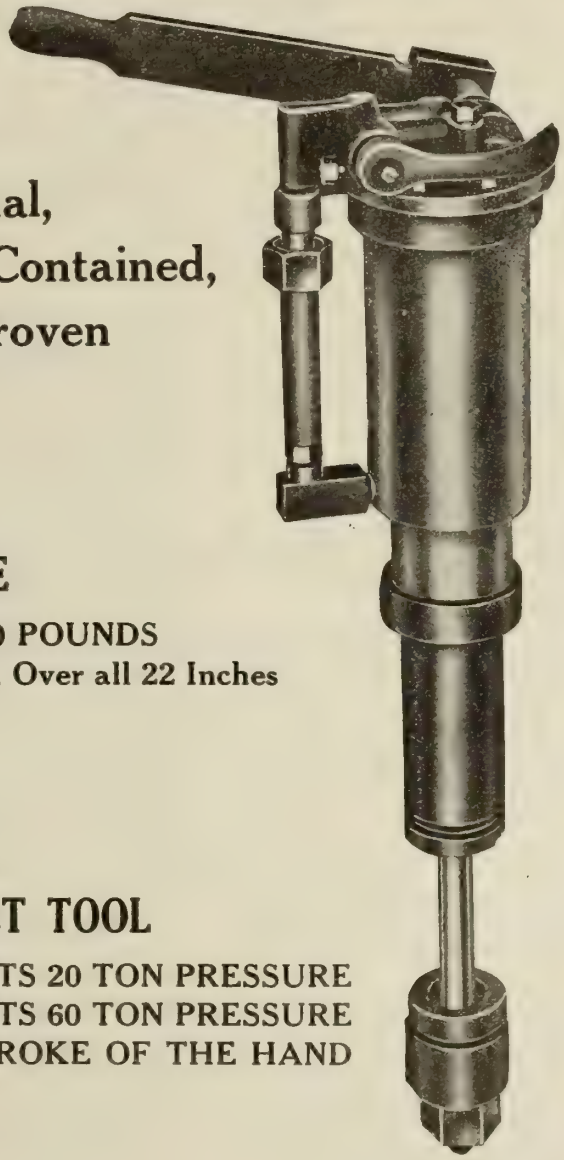
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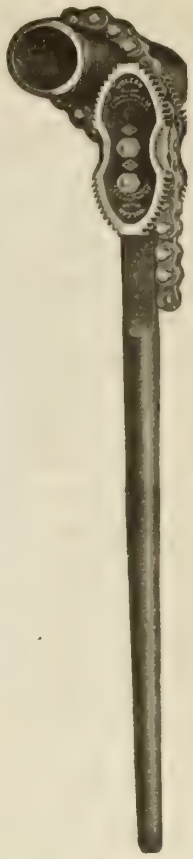
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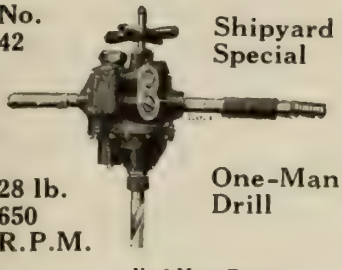
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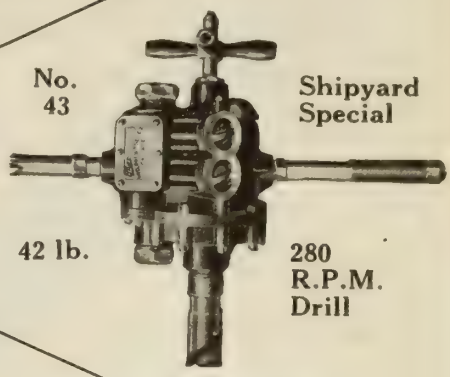


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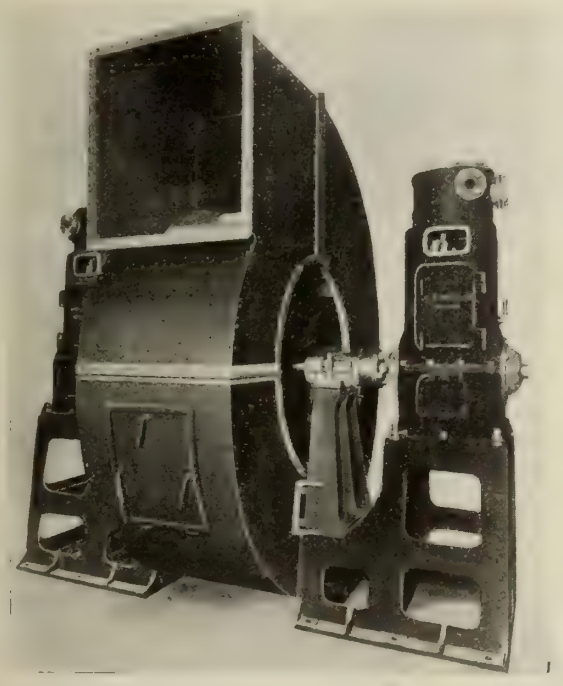
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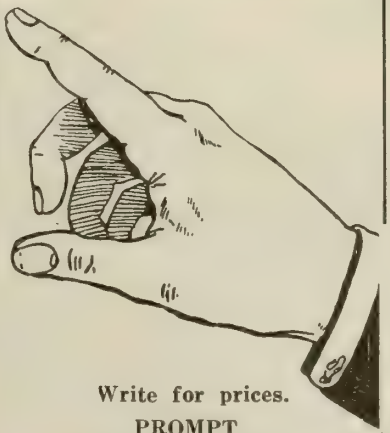
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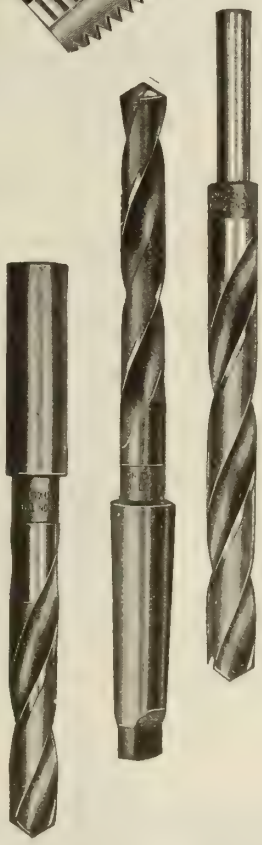
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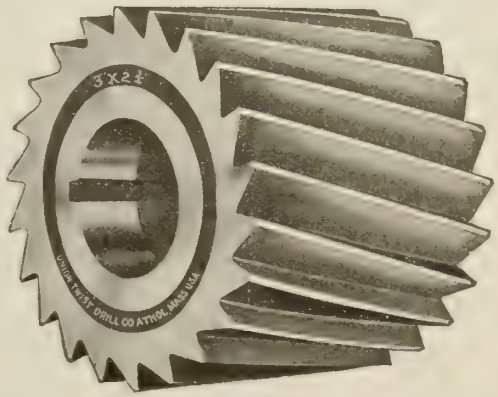
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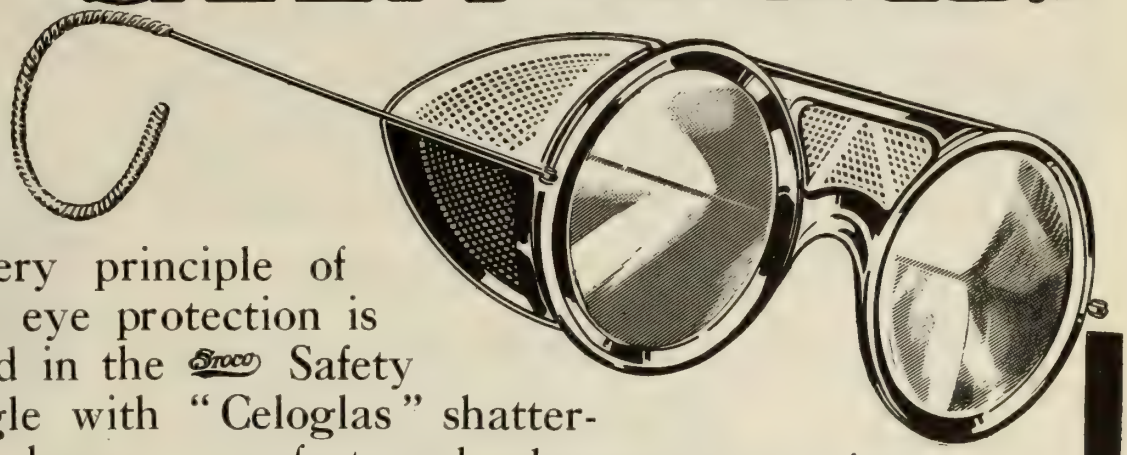
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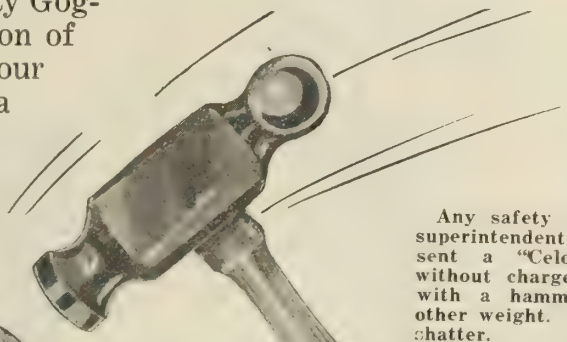
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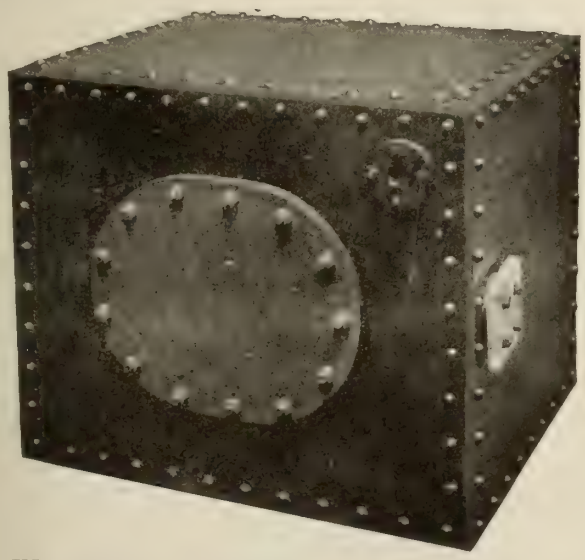
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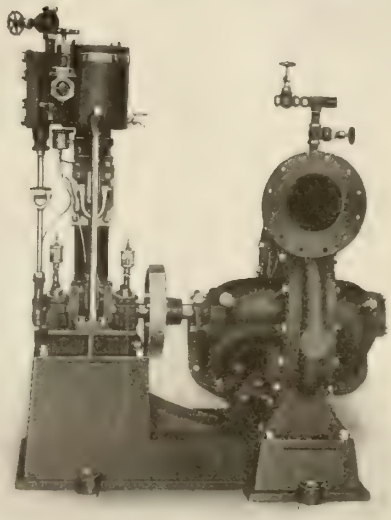


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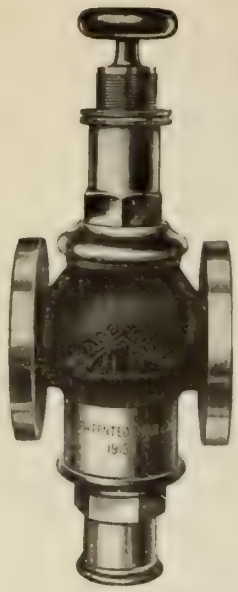
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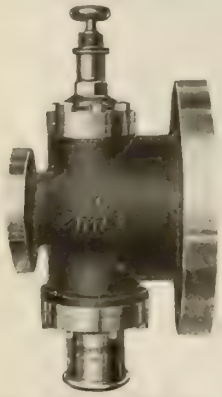
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Reducing Pressure Valve
Standard Pattern
Iron Body, Bronze Mounted

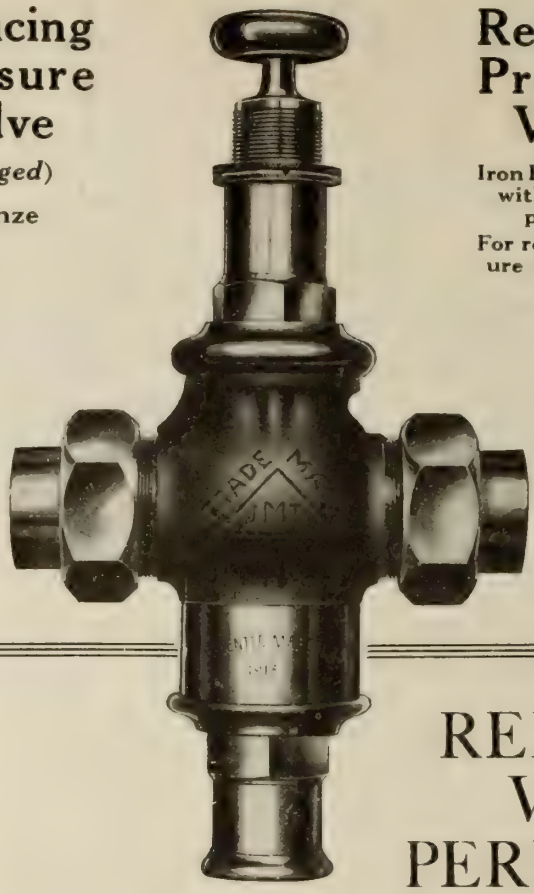


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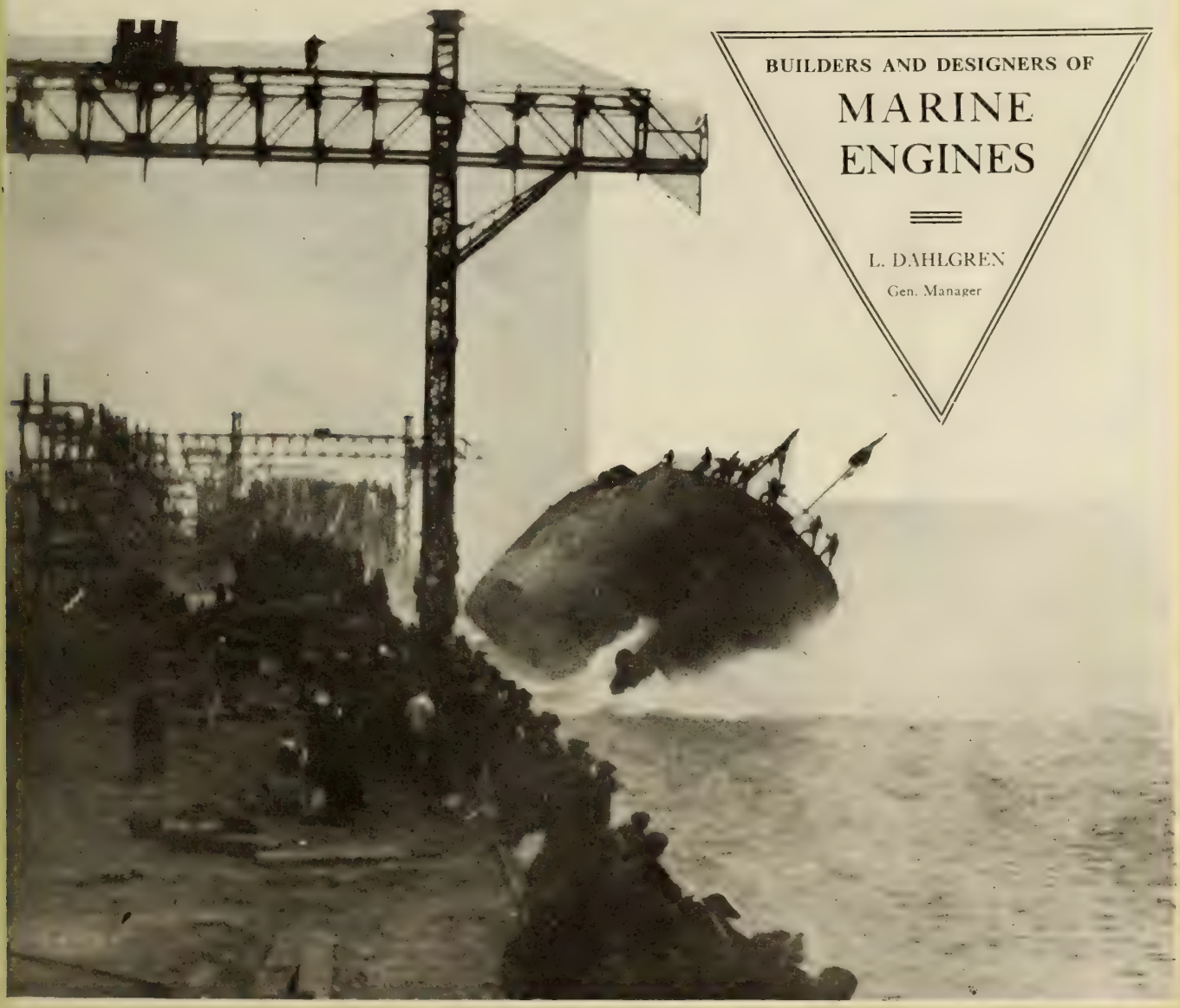
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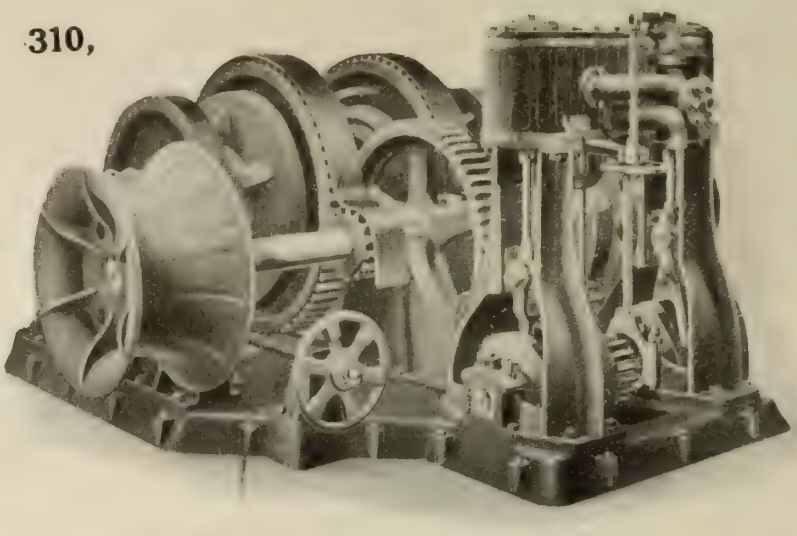
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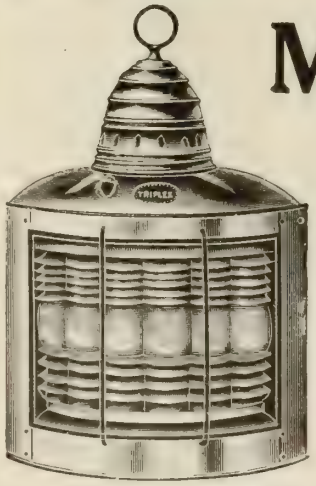
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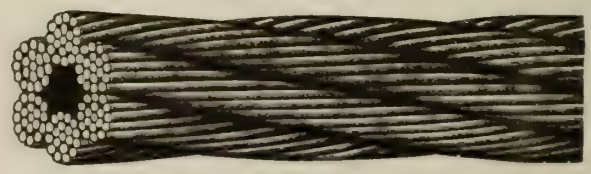
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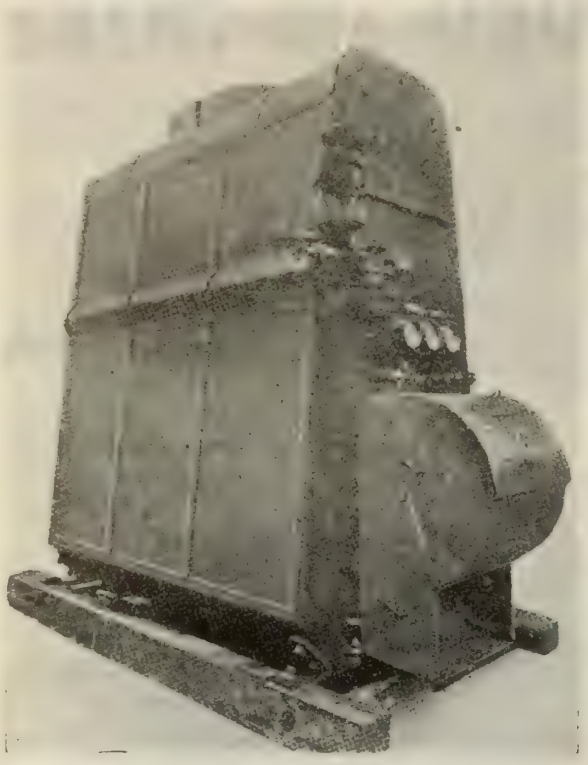


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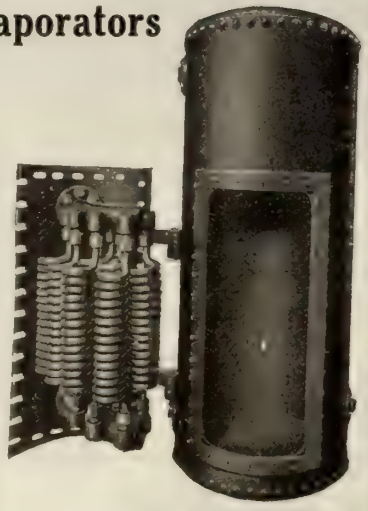
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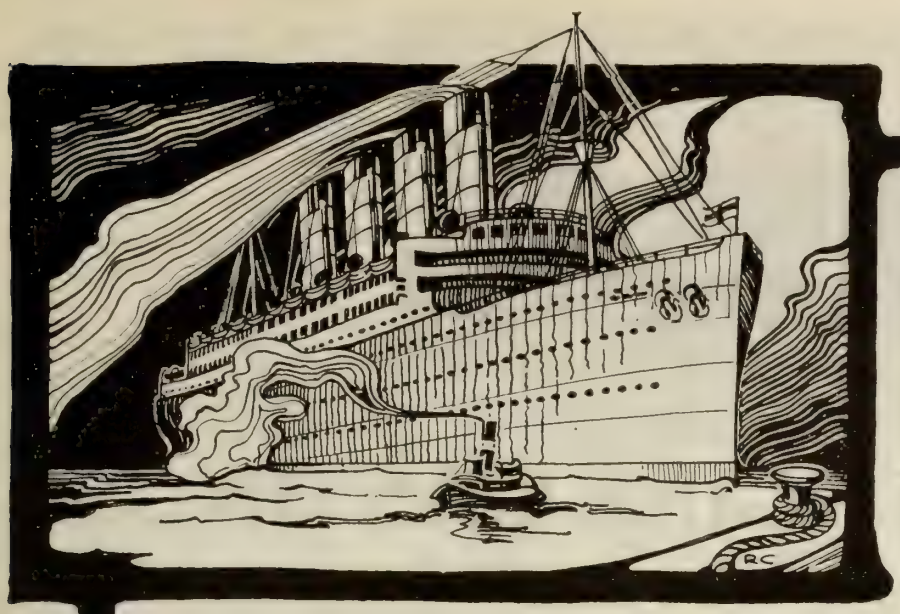
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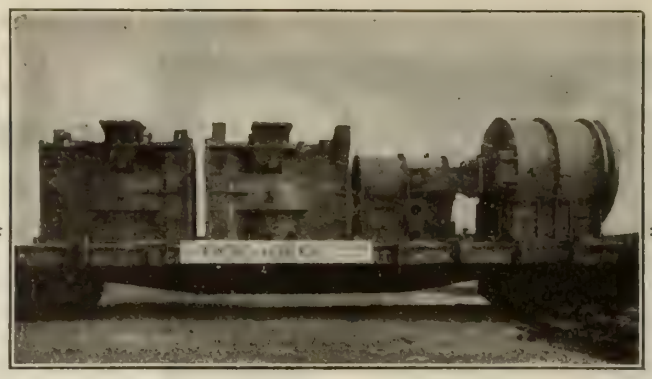
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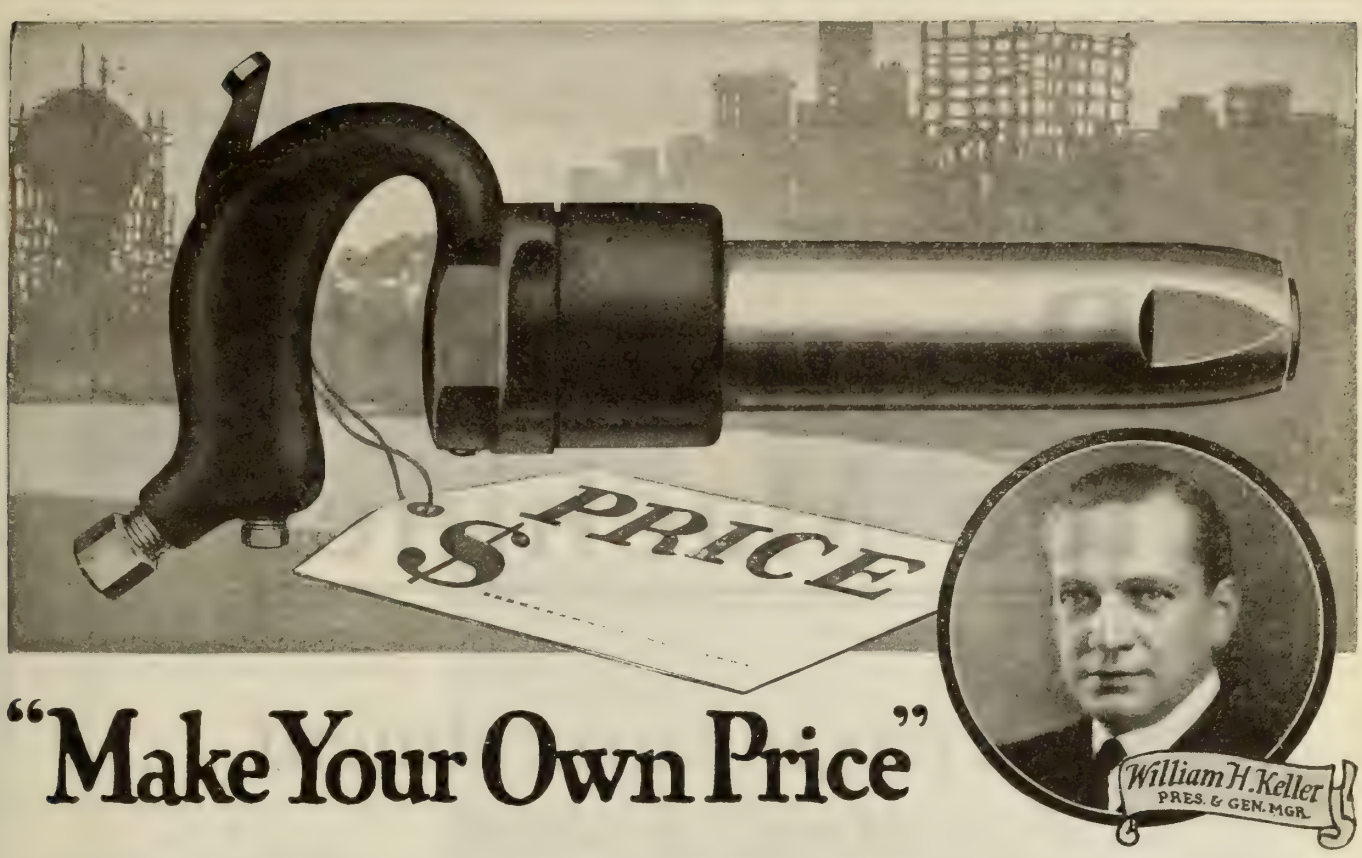
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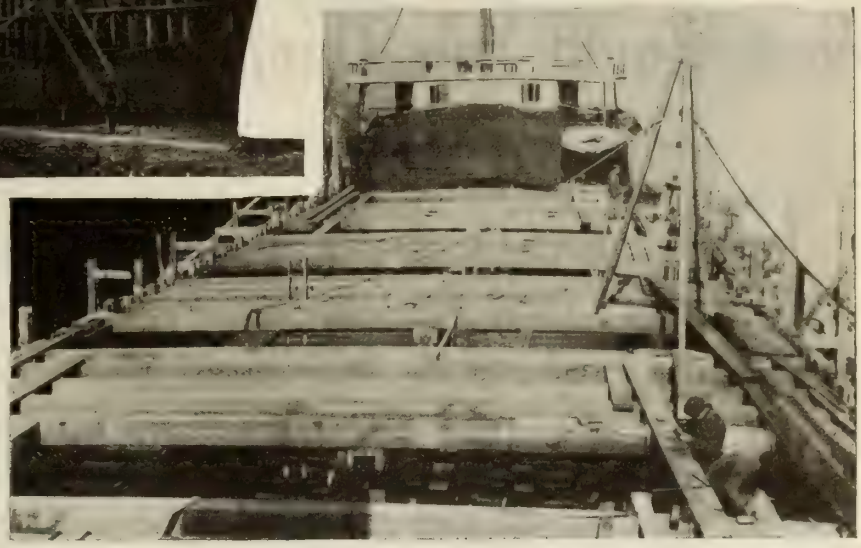
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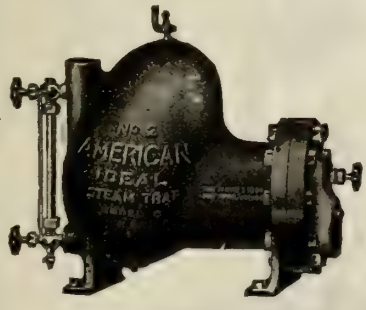
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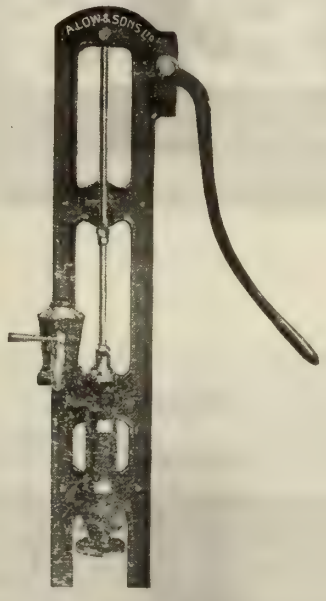
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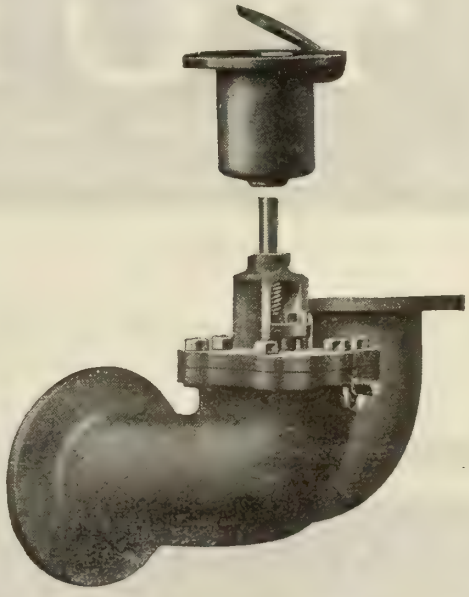
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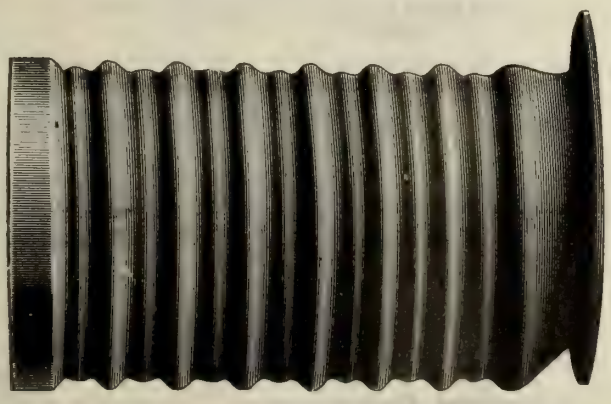
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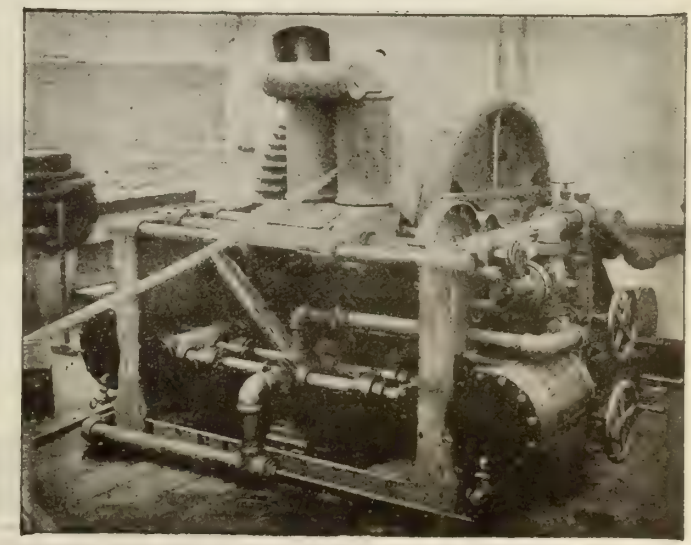
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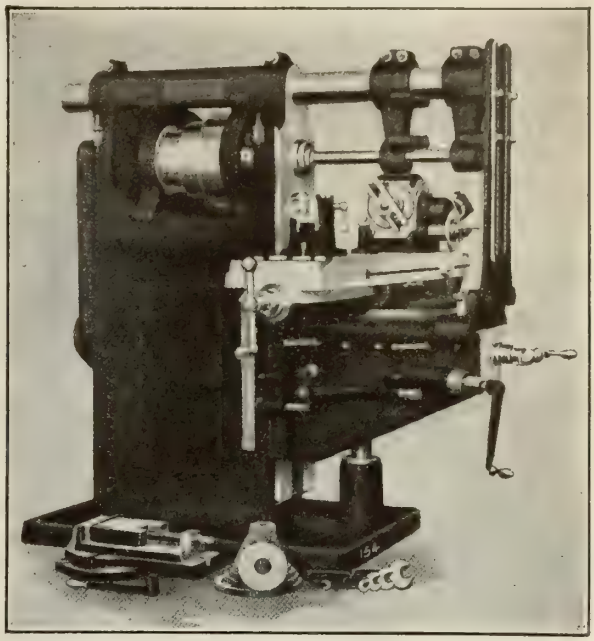
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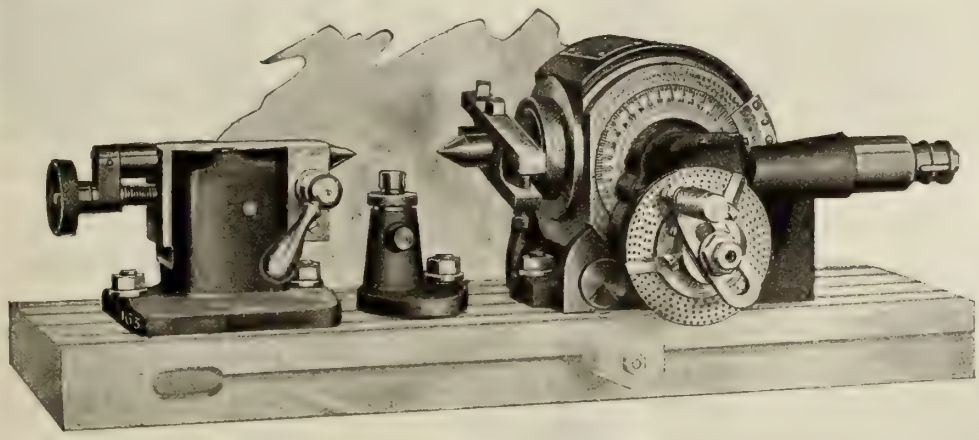
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Port Arthur Shipbuilding Company, Ltd.

PORT ARTHUR, ONTARIO, CANADA

Designers and Builders

Steel Ships, Engines, Boilers, Etc.

Noronic

Leaving plant of Port Arthur Shipbuilding Company, Ltd., on completion, May, 1914.



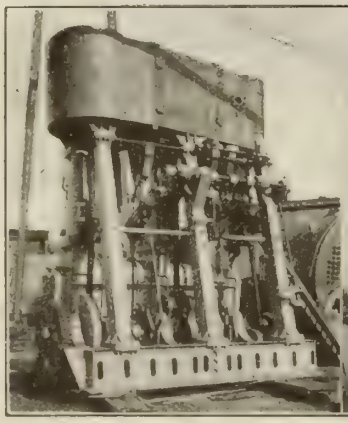
Passenger and Freight Steamer

Length Overall 385 ft.

Breadth Moulded 52 ft.

Depth Moulded 28 ft. 9 in.

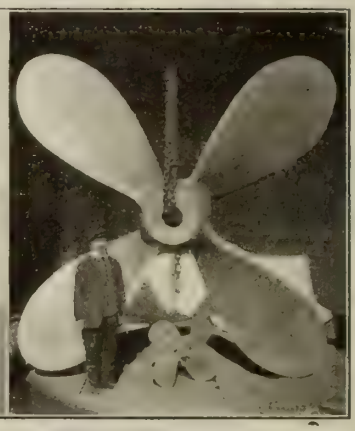
Gross Tons 6,905



1500 H.P. Engine, Triple Expansion



Fourteen of these Trawlers for Dept. of Naval Service



Wheel Casting 14 ft. 9 in diameter

W. Grant Morden

coaling at C. N. R. Coal Docks, Port Arthur.

Built at Port Arthur Ship building Company, Ltd. Year 1914.



Bulk Freighter

Length Overall 625 ft.

Breadth Moulded 59 ft.

Depth Moulded 32 ft.

Gross Tons 8,973

The above are some of the products of our plant

We are also fully equipped with every modern facility for REPAIR WORK

DRY DOCK 700' x 93' x 16'
Four Building Berths

General Offices and Plant:
PORT ARTHUR, ONTARIO

MARINE ENGINEERING
and
Canadian Merchant Service Guild Review

Volume IX. TORONTO, MAY, 1919 Number 5

Recent Additions to the British Royal Navy

Sir E. Tennyson D'Eyncourt's Paper Read Before the Institution of Naval Architects—New Methods of Protection From Torpedo Attack—Various Types of Ships Developed

HAVING obtained the sanction of the Admiralty to give some particulars of vessels added to the Fleet during the war, I suggested to the Council of the Institution when putting forward proposals for reading a paper, that in view of the very large amount of design work and construction carried out by the Admiralty during the period under review, it would, on the whole, be most useful and interesting to give a sketch and general summary of all the work rather than select a few types of warships and give a more detailed account of their design and construction.

To take ships added to the Navy during the war in the proper order, it is necessary to begin with battleships of the "Iron Duke" class. The particulars of all previous Dreadnoughts are pretty well known and have been published. The "Iron Duke" class, of which there were four, followed the "King George V" class both in sequence of time and in general characteristics. The same main armament, similarly arranged, with the five turrets all on the centre line of the ship, was adhered to, the chief difference in the Iron Dukes being that instead of the 4-in. guns forming the secondary armament, a battery of twelve 6-in. guns protected by 6-in. armor was, after considerable discussion, finally decided upon. The protection also was somewhat increased over that of the King George V., involving an increase in dimensions over any of our previous battleships, due to the addition of these weights and of other items. Two of the class had been laid down in January, 1912, and two in May, the four vessels being completed in March, June, October, and November, 1914, so that two were ready just before, and two shortly after the declaration of war. Four torpedo tubes were carried in lieu of three in the previous ships, and after the Battle of Jutland a considerable amount of additional protection was added over the magazines—a course which was practically adopted in all our ships at that time as a precautionary measure. Only in one case was any portion of a shell found to have penetrated below the protective deck; but with the ever-increasing range at which actions have been fought and the increasing penetration of improved shell the danger of the decks being inadequate had to be considered.

The tables appended give the general particulars of these ships and of all the others with which I am dealing in this paper. It should be mentioned, however, that the speed obtained on trial was approximately 22 knots, or about a knot in excess of the legend speed.

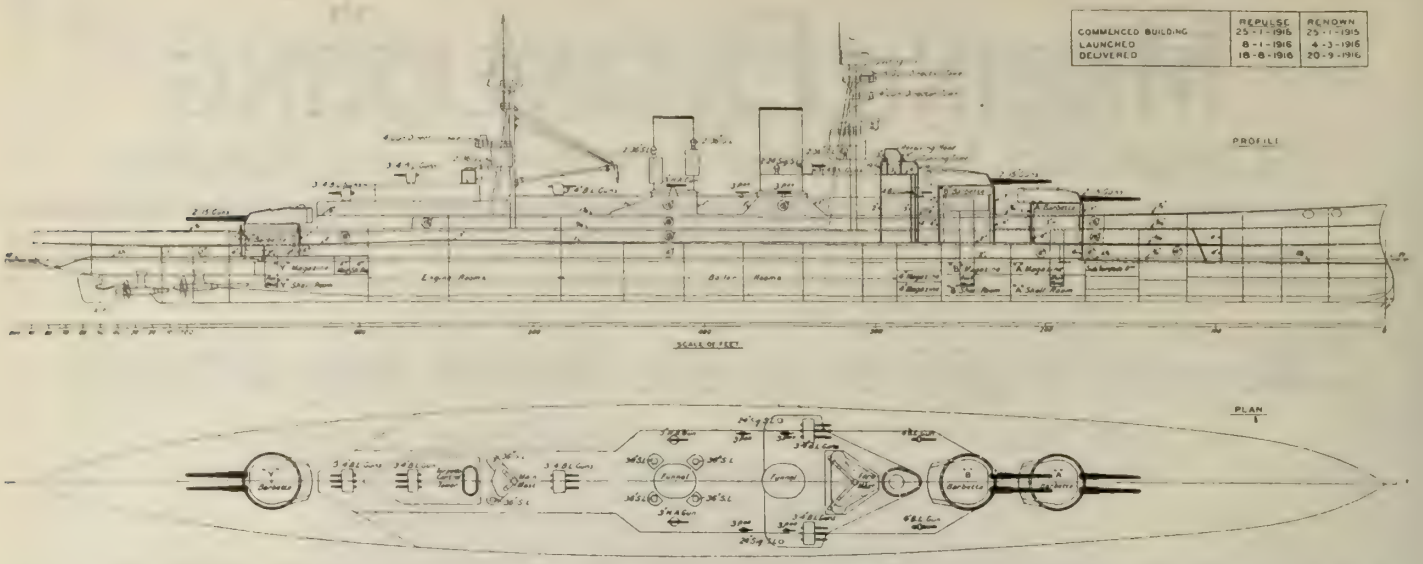
Special interest is attached to this class, as the Iron Duke was the Fleet flagship during the whole time of Admiral Jellicoe's appointment as Commander-in-Chief, and she was in action at Jutland with her sister ships. The Marlborough, it should be especially noted, was the only British battleship of the post-Dreadnought type struck by a torpedo during the whole war, and the value of the longitudinal protective bulkhead and of the subdivision and arrangements adopted was clearly shown, as the ship was able to remain in the line, no vital damage being done. She was afterwards safely docked in the Tyne and repaired. This is, I think, specially interesting, as many of our older ships, some with centre-line bulkheads and with other arrangements not so good for dealing with under-water damage, were sunk in the Dardanelles and elsewhere by enemy torpedoes.

The next type to note is the "Queen Elizabeth" class of the 1912-13 program. Three of these vessels, after taking a little more than two years to build, were completed in January, March, and October, 1915. The other two were completed in February, 1916. A very considerable departure was made in the Queen Elizabeths from any previous Dreadnoughts, the 15-in. gun taking the place of the 13.5-in., and the designed speed being increased by 4 knots over our previous Dreadnoughts. whilst the secondary armament was similar to that of the Iron Duke, consisting of 6-in. guns. Their very great increase of speed involved practically doubling the horsepower necessary to give the 25 knots desired, and the great increase in the weight of the 15-in. guns and mountings over the 13.5-in. meant accepting only four turrets with eight 15-in. guns, as against five turrets with ten 13.5-in. guns in our previous ships, and even so the armament was considerably heavier. The further great departure from previous practice in battleships was the adoption of oil only as the fuel. This necessitated special arrangements of the oil bunkers, many of which were 30 ft. in height, and required special construction to withstand the head of oil. The armour and protection were fully maintained as compared with previous ships, but all these additions involved increasing the displacement to 27,500 tons.



H.M.S. "REPULSE."

In the Battle of Jutland, the Fifth Battle Squadron, consisting of four vessels of this class, were heavily engaged



H.M.S. "REPULSE" AND "RENOWN."

for several hours, and although they inflicted and sustained heavy punishment, especially in the case of Warspite, all the vessels gave a splendid account of themselves and were not seriously damaged or put out of action. After the Battle of Jutland additional protection was added to the magazines. It may be mentioned that the oil fuel proved a complete success, it being found easier to keep up a high sustained speed, and a smaller complement also is, of course, involved, as there is great saving in personnel as against that required for a coal ship.

I should mention that Sir Philip Watts was responsible for the design of the "Iron Duke" and "Queen Elizabeth" classes, thus completing a series of twenty-seven battleships of the "Dreadnought" class designed and built during his tenure of office at the Admiralty—in addition to the large number of battle-cruisers and light cruisers and other vessels built during that period—truly a great record.

Battleships of the "Royal Sovereign" Class

Next in order came the "Royal Sovereign" class of the 1913-14 program. These vessels were to have the same armament as the Queen Elizabeth, but as there was some question about the supply of oil fuel when the design was discussed, it was decided to revert to coal, and also to accept the slower speed of 21 knots, which would make them more homogeneous with other Dreadnoughts. Subsequently, when the vessels were in process of construction and the great advantages of the use of oil fuel with other types of warships became apparent, it was decided to change from coal to oil, and it was anticipated that increased power giving a speed of of about 23 knots would be obtained. As a matter of fact, when fully laden with about 4,000 tons of oil, the Revenge attained 22 knots, which was equal to about 23 knots in the designed load condition. A different disposition of deck and side armor was also adopted by which the thick protective deck at the centre of the ship was brought up to the level of the main deck; this portion of the protective deck being thus well above the level of the deep load line and giving more protected freeboard in the damaged condition than in any of our earlier battleships. This was an important feature, as a somewhat reduced metacentric height was decided upon for these ships with a view to making them steadier gun platforms than some of the ships with larger G.M. The vessel was provided with good under-water protection, which, in certain of the ships, was further reinforced by adding outside bulge protection. This was done to the Ramillies before her launch and also to two other vessels of the class after they had been in commission some time, during refit, and it is proposed to add the bulge to the remaining two ships of the class when opportunity offers.

The addition of bulges was suggested by myself originally for the "Edgar" class, for which I designed this form of protection in 1914, after considerable experiments had been made. The results have proved the efficiency of the bulges.

Further particulars of the "Royal Sovereign" class can be seen from the Supplement and the table.

Battleships Taken Over From Foreign Governments

The three ships taken over from foreign Governments were of different types, as shown in the table of particulars.

H.M.S. Agincourt—Supplement— was commenced in September, 1911, for the Brazilian Government, when I took out various designs—got out under Mr. Perrett at Elswick—to Rio de Janeiro and finally settled on the design of the Agincourt, after modifying it very considerably on the spot. The Brazilian authorities, after much discussion, decided upon fourteen 12-in. guns, twin-mounted in seven turrets. This involved a ship with a length of 630 ft. between perpendiculars and 670 ft. over all. The main armor was somewhat lighter than our British Dreadnoughts—as seen from the particulars attached—and in other respects, such as fuelling facilities, the ship hardly came up to the British standard. However, she was well reported on and the fourteen big guns were liked by the gunnery officers, who preferred a large number of guns for their salvoes. Certain alterations had to be made to fit her for our service, but in the main she was left as designed.

I should perhaps mention that in 1914 she was transferred from the Brazilian Government to the Turkish Government, and when war broke out she was on the point of leaving for Constantinople, when she was taken over.

The design of the Erin—Supplement—was settled by the three firms, Armstrongs, Vickers, and John Brown, in consultation with the Turkish authorities, for whom the vessel was built, being commenced in November, 1911. In general characteristics she more nearly followed the "King George V." class than any other British ship, except that the secondary armament consisted of 6-in. guns, as in the "Iron Duke" class. This vessel also was taken over by the British Government in August, 1914, and certain modifications made to fit her for the British Service. In respect of quantity of fuel carried, the Erin was below the standard adopted for vessels designed for the British Navy.

The third ship taken over from a foreign Government was ordered and commenced in 1911 at Elswick from designs prepared by Mr. Perrett for the Chilian Government. There were two ships of the class, the Almirante Latorre—now the Canada—and the sister ship, the Almirante Cochrane—now the Eagle. The Canada has ten 14-in. guns, twin-mounted, in the centre line, and was originally designed, to have twenty-two 4.7-in. as the secondary battery, but this was subsequently altered to sixteen 6-in. guns. The protection again was somewhat lighter than that of our own

Dreadnoughts, but the speed was rather higher, viz., 22¾ knots, and as a matter of fact this speed was considerably exceeded on trial. The ship was taken over by the British Admiralty in September, 1914, and completed, after certain necessary modifications, a year later. Her fuel consisted of coal, with the addition of a certain amount of oil, as in most of our battleships.

The sister ship, Almisrante Cochrane, remained in an uncompleted condition on the stocks at Elswick till the spring of 1917, when she was taken over by the British Government and rearranged as an an aircraft-carrying ship. She was renamed H.M.S. Eagle, and as a compliment to the United States Navy, she was, at the request of the Admiralty, launched by Mrs. Page, the wife of the late American Ambassador.

The above record finishes the list of battleships proper which were completed for service during the war.

Large Battle-Cruisers

Coming to the battle-cruisers, particulars have already been published of all those down to H.M.S. Tiger. This ship was included in the 1911-12 program and followed on the Queen Mary, the general features of the two ships being much alike, the chief differences being that the secondary armament of Tiger is twelve 6-in. guns in lieu of sixteen 4-in. in Queen Mary, and Tiger has two submerged torpedo rooms, whereas Queen Mary had only one.

After the design was approved by the Board the ship was ordered and laid down at Clydebank on June 12th, 1912, and completed in October, 1914. In common with so many of our ships completed during the war, the early commissioning and joining of the Fleet was so imperative that no exhaustive trials in deep water were carried out, but the runs made on the Polperro Course showed that the designed power of 108,000 S.H.P. could be obtained with little difficulty, corresponding to a speed of 30 knots. During the progress of the design the oil fuel capacity was very largely increased in case of need; the original tanks, which only allowed for 1,100 tons, were supplemented to admit of a maximum oil stowage of 3,480 tons, in addition to the 3,320 tons of coal; but it is not usual for the vessel to carry this full fuel stowage, at any rate of oil.

Battle-Cruisers Renown and Repulse

At the commencement of the war two additional battleships of slightly modified "Royal Sovereign" type, viz., the Renown and Repulse, had been laid down, but in view of the long time it would take to complete these ships, the construction was not pressed forward. Immediately after the Battle of the Falkland Islands, in which our battle-cruisers Invincible and Inflexible, in company with other smaller cruisers, annihilated Von Spee's fleet, the value of the battle-cruiser type became very apparent, and on the initiative of Lord Fisher, then First Sea Lord, it was decided to stop the construction of Renown and Repulse as battleships and to alter the design completely into that of very fast battle-cruisers.

I received instructions to re-design these ships about Christmas, 1914. The new design had to give a speed of 32 knots, with the largest number of guns possible for such a vessel, and with protection similar to the "Invincible" and "Indefatigable" classes. A modified form of bulge was adopted in these ships to give additional under-water protection against torpedo attack. Proposals are now under way for still further adding to this bulge protection.

The general outline design was completed and approved in ten days, and six 15-in. guns adopted as the main armament, the secondary armament consisting of seventeen 4-in. guns, of which fifteen were mounted in five specially designed triple gun mountings. Owing to the circumstances, referred to above, it was necessary that the ships should be completed at the earliest possible date, and I suggested that Tiger's machinery should be repeated with some additional boilers, and with the extra length it was found possible to obtain the speed of 32 knots, as laid down by the Board. Lord Fisher also insisted that the ships must be completed within fifteen months—an abnormally short time for an entirely new design, without any drawings prepared. This period of completion was not realized, although not greatly exceeded.

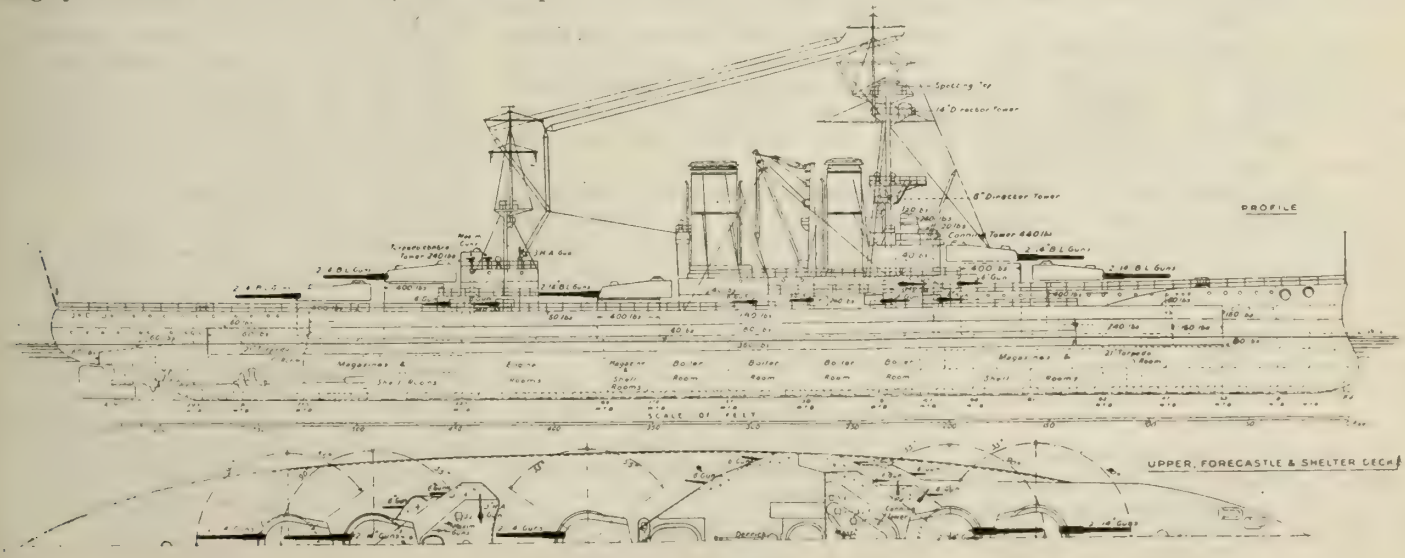
By January 21st, 1915, the two firms entrusted with the orders, viz., Messrs. John Brown and Fairfield, were supplied with sufficient information to enable them to proceed with the structure, and both keels were laid on January 25th. All the drawings and specifications were completed by April and the design finally approved in that month. The fuel was to be entirely oil, and with the additional boilers the power expected to be from 110,000 to 120,000 S.H.P.— the latter having actually been obtained on trial.

The arrangement of the whole ship, showing the protection, is given in the drawing (see Supplement); the plating over the magazines was considerably increased during the construction as a result of the Jutland fight.

Repulse was launched in January, 1916, less than a year from the laying down, and the Renown was launched three months later. Repulse went through her commissioning trials early in August, and Renown followed one month later and was completed in September.

The speed of Repulse on trial was over 31¼ knots in the deep condition, and the Renown obtained 32.6 knots mean speed on the new measured course off Arran in the normal condition. The ships have been well reported upon at sea and maintain their speed well.

I think that the construction of these vessels in a little over one and a-half years from the first order to get out the design constitutes a record in design and construction of two such important vessels, and reflects great credit, not only upon the Royal Corps of Naval Constructors, but also upon the contractors and all concerned in the construction and completion of the vessels. In fact, the Admiralty conveyed their apprecia-



H.M.S. "CANADA."

tion of this to me in a letter dated September, 1916.

Large Light Cruisers Courageous, Glorious and Furious

Whilst the designs of Renown and Repulse were in progress I received instructions to design some very high-speed ships carrying powerful guns of a size sufficient to keep their speed in moderate weather, but to have a draught lighter than any existing British or enemy ship of the same class, so as to be able to navigate shallow waters, if required.

As sanction was not likely to be obtained for building more capital ships taking two years or longer to complete, while additional light cruisers had been already approved of, it was decided to build Courageous and Glorious on the lines of very large light cruisers mounting a few guns of heaviest calibre, so as to be able to annihilate any enemy light cruisers or raiders. They were to have thin protection, similar to our light cruisers, and a speed of not less than 32 knots, the draught being restricted to about 22 ft., or about 5 ft. less than any existing battleship or battle-cruisers carrying such heavy guns, the main armament of four 15-in. guns in two turrets, one forward and one aft, making them a match for any raider or light cruiser that might be encountered. At this time it should also be remembered that the armaments of ships, especially as regards heavy guns, had to be regulated by the guns and gun mountings which would be available or could be manufactured in the time at our disposal, and this condition applied to the 15-in. mountings which were adopted for these ships. The secondary armament consisted of eighteen 4-in. guns in six triple mountings, similar to the triple mountings of the Renown and Repulse. The side armor consisted of 2-in. protected plating on top of the 1-in. shell plating, as in our light cruisers, and a thin protective deck was worked all fore and aft, but this was considerably thickened over the magazines after Jutland. A modified bulge was arranged for, as in Renown and Repulse.

The machinery adopted for these ships was of the type fitted in the light cruiser Champion. It consisted of a four-shaft arrangement of geared turbines, the power being transmitted to the propeller shafts by double helical gearing. The eighteen boilers of Yarrow small-tube type were also similar to those of the light cruisers, and with all-oil firing a power of 90,000 S.H.P. at about 340 revolutions was aimed at. Such trials as it was possible to make showed that 32 knots could easily be obtained at the designed displacement, and reports show that on service this was actually exceeded.

The design of these vessels was begun late in January, 1915, and the order for one ship—Courageous—was placed with Messrs. Armstrong, and the other —Glorious—with Harland and Wolff, the latter making their own machinery and Messrs. Parsons supplying the machinery for Messrs. Armstrong's ship.

It was intended that these vessels should be built in a year, or as near that as possible, but this was not realized, and the ships were both commissioned in October, 1916.

On her commissioning trials the Courageous worked up to full power, and while steaming during the trials at full speed she met her heavy weather. Some signs of weakness were shown at the fore side of the forward turret, where there is an inevitable discontinuity of longitudinal strength, and some doubling plates were accordingly added to the Courageous. Her sister vessel Glorious was in commission for over a year before similar additions were made to her, although no signs of weakness were shown. This incident shows that the very high speed obtained on trial reaching 32 knots, should hardly be maintained against head seas in heavy weather.

The Furious was similar to, but a modification of, the Courageous and Glorious, having about the same length and the same machinery, but the form of midship section was somewhat different, having a more pronounced bulge and a simpler form of main framing and structure of the hull. The armament also was different, each turret, instead of having two 15-in. guns, was arranged to carry one big gun of 18-in. bore, although arrangements were made to substitute pairs of 15-in. guns, if thought desirable later.

The order for this ship was placed with Messrs. Armstrong about two months after that of Courageous, and she was to be finished in the shortest possible time. Early in the spring of 1917, however, the necessity for having fast aeroplane carriers became very obvious, and it was approved to fit Furious for this purpose. This entailed doing away altogether with the fore turret and making other considerable alterations. A large hangar was built on the forecastle deck, and a flying-off platform 160 ft. long was arranged on the roof of the hangar, which was designed to house about ten machines. Later it was decided to remove the after turret as well, and a flying-on deck 300 ft. long, extending from the funnel aft, was constructed.

The secondary armament, which had consisted originally of eleven 5½-in. guns, was retained, with the exception of one gun; the remaining ten guns being arranged. Four sets of triple 21-in. torpedo tubes were fitted on the upper deck aft, and one pair each side on the upper deck forward.

After these alterations were completed the ship was tried and commissioned in July, 1917, a speed of 31½ knots being obtained with 94,000 S.H.P. at 330 revolutions.

Light Cruisers

Following upon the previous light cruisers of the "Town" classes, the particulars of which have already been published, a very important departure was made in the light cruiser design in the programme 1912-13, when the "Arethusa" class was designed by Sir Philip Watts. The importance attached to speed was specially brought out in this design, and it was decided to install a very powerful machinery with a shaft horse-power of 40,000, and this could only be achieved by adopting a type of engines and boilers closely approximating to those hitherto used for destroyer classes.

In conjunction with high speed a good armament was provided, consisting of two 6-in. and six 4-in. guns, though in the original design the armament consisted entirely of 4-in. The ship's sides up to the level of the upper deck were protected by specially high tensile plating varying from 2-in. to 1½-in. and 1-in. throughout the machinery spaces, in addition to the 1-in. shell plating. This arrangement of plating also greatly added to the strength and stiffness of the ship regarded as a girder. Further particulars of the class are given in the table.

The Arethusa and other light cruisers were in the action off Heligoland on August 28th, 1914, and gave an excellent account of themselves.

In the 1913-14 programme the "Calliope" class, slightly larger vessels than the Arethusas, but with the same power, were decided upon. After considerable discussion regarding the merits of mixed or homogeneous armament it was decided to give these vessels two 6-in. guns, both on the centre line placed aft, and eight 4-in guns. The protection consisted, as in the previous design, of a 2-in. belt over the shell plating, making a total thickness of approximately 3-in. Most of this class had practically the same machinery as the Arethusas, but Parsons geared turbines were installed in two of them, the Calliope having four shafts and the Champion having only two shafts. This was at the time a very important experiment, the putting of 20,000 horsepower through gearing being a very bold departure from anything which had been hitherto contemplated. The final results obtained with Champion were, however, excellent, and she obtained a speed of 29½ knots with 337 revolutions and about 41,000 S.H.P., this speed being slightly in excess of any of the other vessels of the class at corresponding displacement.

For the subsequent classes I would refer to the tables, which show a gradual growth in size and power of armament; "Ceres" class finally having a length of 425 ft. and a beam of 43 ft. 6 in., and a normal displacement of about 4,200 tons. These vessels carried five 6-in. guns, all on the centre line.

(To be continued)

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

WITH a large number of firms all over Canada, engaged in the production of marine engines and boilers, together with auxiliary machinery, there are a considerable number of apprentices and workmen employed on this interesting work.

In addition to this, there are hundreds of boys and young men in the shipyards, who are seeing the installation of the machinery in the ships, day after day, who cannot fail to take an interest in what they see.

In many cases, there is no great opportunity for these young men to acquire a deeper knowledge of this machinery than that gained by the work performed on them, however keen their desire may be so to do.

There are many others engaged in various capacities on board vessels in the Inland waters, who would welcome the opportunity to gain a measure of technical knowledge without the necessity of devoting hours of their shore time to the purpose.

It is due to requests from several men of these various classes that this series of articles has been undertaken. It will in no sense be understood as a course, the idea being rather to present a number of lectures, each complete in itself, but bearing a distinct relation to the immediately preceding and succeeding one. Commencing with a study of the various materials used in the construction of engines and boilers, their properties and suitability for the purposes used, the articles will follow on through the building and erection of the machinery, its installation in the vessel, and the maintenance and operation while afloat.

Involved calculations will be avoided, and where any work of a character liable to be not well understood is encountered, the principles involved will be clearly explained.

The author would welcome criticisms or suggestions from readers in reference to these articles.

Cast Iron

The material most largely employed in the construction of marine or stationary engines, pumps, condensers, etc., is iron. In some parts of the engine it is used in the cast state while for other parts it is converted into steel before being used. Whether used as cast iron, wrought iron, or steel, the basic material is iron. This is obtained from the natural ore in the mine, the ore being melted in a blast furnace under intense heat, and run off in the form of pigs, which are billets about 100 lbs. each.

The ore when taken from the mine, contains about 50 per cent. metallic iron, and the bulk of the remaining 60 per cent. is removed in the smelting process. Different ores contain different impurities, and the ores are mixed in the blast furnace in such a way as to give an iron of a definite chemical composition when made into pigs.

The composition will vary somewhat according to the purposes it is to be used for. The following tables, taken from a book by a well-known English writer, Mr. John Sharp, show the composition of different grades of cast iron:

TABLE I.

Composition	For Foundry Castings			For Chill Castings		For Steel Castings
	No. 1 Pig	No. 3 Pig	No. 4 Pig	Mottled Pig	White Pig	Hematite Pig
Iron	91.24	92.33	93.06	94.60	95.55	93.43
Carbon Graphitic	3.50	3.15	2.96	2.50	2.33	3.70
Carbon Combined						
Silicon	2.40	1.90	1.60	.80	.30	2.60
Sulphur	.02	.03	.05	.22	.35	.02
Phosphorus	.86	.86	.86	.92	.97	.05
Manganese	2.00	1.71	1.40	.85	.40	.20
	100.02	99.98	99.93	99.89	99.90	100.00

TABLE II.

Composition	English Pig Iron				American Pig Iron			
	Clarence		Skimmingrove		Ord. Brands		Spec. Str'g Brd.	
	No. 3	No. 4	No. 3	No. 4	From	to	From	to
Iron	91.805	92.644	91.892	92.424	94.77	93.55	95.89	94.54
Carbon—								
Graphite	2.91	2.90	3.02	2.97	2.50	2.90	1.50	2.00
Combined	.38	.30	trace	.19	.35	.45	1.15	1.30
Silicon	2.70	2.02	2.95	3.35	1.50	2.00	.70	1.70
Sulphur	.037	.076	.008	.056	.07	.10	.05	.06
Phosphorus	1.64	1.50	1.53	1.53	.50	.60	.40	.50
Manganese	.53	.56	.60	.48	.31	.40	.31	.40
	100.	100.	100.	100.	100.	100.	100.	100.
Melting point.	1200° C.		1200° C.		1100° C.		1200° C.	
Ten. strength.	8 tons p. sq. in.		9 tons p. sq. in.		5 to 9 tons p. sq. in.		13 to 15 tons p. sq. in.	
Density, C.I.	7.25							
" M. Steel	7.8							

TABLE III.

Composition	I.		II.		III.	IV.	V.
	Open Hearth Steel		Wrought Iron		Ingot Steel	Coolgardie 30" diar. S. Pipe	Perth 21" diar. S. Pipe
Iron	99.465	98.915	99.657	97.950	99.92	99.290	99.102
Carbon—							
Graphitic	.....	.....	.....	.....	....	.....	.....
Combined	.100	.200	.020	.250	.02	.173	.147
Silicon	.005	.010	.020	.100	trace	.010	.038
Sulphur	.015	.045	.001	.100	.02	.050	.101
Phosphorus	.015	.030	.001	.100	trace	.035	trace
Manganese	.300	.500	.001	.250	.01	.432	.612
Slag (Oxide of Iron)	.100	.300	.300	1.250	.03	.....	.....
	100.000	100.000	100.000	100 000	100.00	100.000	100.000
Tensile Strength	Tons p. sq. in. 22-29		Tons p. sq. in. 18-22		Tons p. sq. in. 20-22		

It will be seen from these tables that the cast iron as it comes from the furnace, is composed for the most part of iron, combined with a small percentage of other elements.

The chief of these is carbon, and it exists in the cast iron in two different states. Part of it is combined chemically with the cast iron, and a larger proportion of it exists as separate constituent, as graphite.

According to the amount of this graphitic carbon, the iron will be hard or soft. The presence of the free carbon (graphite) tends to make the structure of the cast iron more coarse in the grain, and thus more ductile. Slow cooling of the metal increases the amount of free carbon, while quick cooling, as in chills, increases the combined carbon, making the metal more closely grained, and therefore harder and more brittle.

Silicon has the effect of increasing the

free carbon, making the iron softer, while it also tends to make the metal less liable to corrosion. The silicon is added to the metal in the furnace when necessary, by adding ferro-silicon, which is a mixture containing from 10 to 15 per cent. silicon, whereby the percentage of silicon in the iron can be definitely judged.

The effect of sulphur is to promote the formation of combined carbon, and thus make the metal very hard and brittle. It also increases the liability to corrosion in the finished metal. The iron will shrink more in cooling if much sulphur is present. The sulphur is taken up from the fuel while being melted, owing to its great affinity for iron. For this reason, a fuel low in sulphur should be used, to keep down the percentage of fuel in the finished article as low as possible.

Phosphorus increases the hardness of the iron, and at the same time causes it to flow more freely in the ladle. It reduces the ductility without adding to the strength. It is derived from the ore.

Manganese is present in the ore, and combines very freely with the other elements in the cast iron. It also, during the melting, combines with the sulphur, forming a sort of flux which runs off with the melting slag, thus counteracting the effects of too much sulphur by reducing the amount left finally in the iron.

The principal parts in which cast iron is used in the marine engine are as follows:—Bed plates, columns, cylinders, guides, valve spindle brackets, pumps, condensers, stoke hold floor plates (not always). It is also used in watertight doors, and their guides, and for some purposes such as cleats, spanner racks, and even spanners, malleable cast iron is used.

Malleable cast iron is an iron closely approximating wrought iron. It can be bent and distorted quite considerably. It is made up of almost pure iron, the elements accompanying it being lower in percentage than in ordinary cast iron. For instance, silicon is present in malleable iron in the proportion of from ½ per cent. to 1 per cent., sulphur not more than seven-hundredths of one per cent., manganese not over four-tenths of one per cent., phosphorus under one-quarter of one per cent., and combined carbon not over 2¾ per cent. After casting the iron is annealed. The illustration shows a panel of samples sent to the Lyons fair in France, by McKinnon Industries, St. Catharines. The bending of the metal without injury can be plainly seen.

Malleable iron is also used in making pipe fittings, because of its comparatively high tensile strength and ductility. It readily adapts itself to the stresses thrown on it by expansion in a line of piping.

Wrought Iron and Steel

Next to cast iron, steel is the metal most used in the construction of marine engines and boilers.

Wrought iron is at the present day, hard to find, most of the metal under this name, being a soft steel. Wrought iron is fibrous in structure, as compared with the crystalline structure of steel. The tensile strength is lower, but the ductility is greater.

Wrought iron is produced in a furnace, the bottom of which is dished out, to form a reservoir. The sides of the furnace are lined with oxide of iron, usually iron ore. The working hearth is surrounded by hollow iron castings, through which a cooling medium, usually water, but sometimes air or steam, can be circulated.

The pig iron is melted on the hearth, and the carbon, silicon and manganese, phosphorus and sulphur are almost entirely removed by agitating the melted mass, causing these elements to oxidize in the gases present. The agitation is performed by man power, and the process is known as puddling. Certain oxides have to be added in small quantities, usually mill scale from the rolls, or hammers,



MALLEABLE CASTINGS SHEWING DISTORTION.

which provide the oxygen to effect the oxidization of the various elements.

The iron is finally drawn from the furnace in what is known as the ball, that is a nearly spherical mass of iron. Its structure is then that of a number of small grains, from 1/32 to 1/16 inch in diameter, each surrounded by a binder known as the cinder, which is a silicate composition. This protects the iron from oxidization, and is a preventive of rust in the finished product.

Under the subsequent rolling, the grains are flattened out into long ropes or fibres, the cinder being welded in with the mass. In perfectly welded iron this cinder will be about 2 per cent. of the volume of the finished product.

Wrought iron is subject to weakness from lamination, which means that the fibres are not closely welded together, but are separated like the leaves of a spring. Good wrought iron is well adapted for boiler tubes, and this is where it finds its chief use at the present day in marine practice.

Steel is made by two different processes, known as the Bessemer and the open hearth.

The making of steel consists of removing from pig and scrap iron all the impurities, and then adding a pre-determined amount of carbon, manganese, or nickel. Other alloys are used for special steels, such as vanadium, but for marine engines, and boilers, carbon is the usual addition made. The effect of a certain amount of carbon is to give the metal a high tensile strength, combined with ductility, which enables it to be worked into various shapes without injury to the metal.

It is outside the scope of these articles to go deeply into the processes involved, these being a distinct study in themselves. A brief description of the two methods mentioned will suffice to give the student an intelligent idea of the means used to produce the required metal.

The Siemens Martin, or open hearth process, is the one principally used in this country, the Bessemer being more in use in Europe.

The hearth is situated in the centre of the furnace, and at each end are large chambers divided up into checkers, or honeycombs, through which gas and air are passed before going over the iron to be melted. These are used alternately, and by doing this they rapidly obtain a great heat. The impurities contained in the mass of iron to be melted, in changing their states, give up heat to the furnace, and by changing the supply of gas and air from one end to the other of the checkers or flues by means of valves, the air is continually reheated, bringing the temperature up to any desired amount. The operator keeps up the process till the impurities are all burnt out, and then the desired amount of carbon and manganese is added by the introduction of a definite amount of a material called spiegeleisen, which contains these elements in known proportions. Samples are drawn and analyzed rapidly till the steel is found to contain the required ingredients, when the metal is poured off into a large ladle, from which the moulds are filled, these forming the ingots.

In the Bessemer process the iron is first melted in the open hearth furnace, and then poured into a vessel known as the converter. This is an open ended, egg shaped vessel, the bottom of which is made hollow, with openings into the interior of the converter. It is mounted on trunnions, which allow it to be tilted over.

When the molten charge is ready to be put in, the vessel is tilted on to its side, the molten metal lying in the hollow formed by the bulge of the egg. The blast is then put on, and the vessel brought back to the vertical shape. The force of the blast prevents the molten metal from running into the tuyeres, or air ducts, and the air, blowing through the bath, supplies the oxygen necessary for combustion. The entire heat necessary for the elimination of the various elements, is supplied by the chemical reactions in the metal itself. The operator can determine, by the appearance of the flame coming from the vessel, the exact condition of the metal, and when the high flame appears which heralds the burning of the phosphorus, the vessel is again tilted, and the blow stopped. The metal then receives the amount of carbon necessary, from .05 to .1 per cent., according to the use that is to be made of it.

Another form of steel is crucible steel, but this is used chiefly for high carbon

steels, such as machine tools, cutlery, and agricultural implement knives. It is made by melting nearly pure iron in clay or graphite pots, covered almost entirely by the fuel used to melt it, from which it absorbs the carbon.

Cast steel is also used, this being poured into molds made from patterns exactly as cast iron is poured, excepting that the moulds have to be more strongly made, and the shrinkage is much greater.

Steel is used for making boiler plates, and plates for ships' hulls. It is also used for shafts, connecting rods, bolts, columns, pistons, main bearing caps, piston rods, valve spindles, etc. The different carbon contents and tensile strengths of steel for the various purposes will be taken up in future articles, when the different parts are treated in detail.

In the next article the various mixtures of copper and tin, known as non-ferrous metals, which enter largely into marine engine construction, will be gone into.

In engineering treatises it is often the practice to leave the consideration of the materials used to a much later period, but the writer feels that a knowledge of the elements he is daily working in, cannot help being of immediate interest to the boy in the shop, as well as to older hands who have, perhaps, never studied their origin.

LLOYD'S REGISTER SHIPBUILDING RETURNS

For Quarter ended March 31, 1919.

A very interesting resume anent the world's output of shipbuilding for the quarter ended March 31, 1919, has been compiled by Lloyd's Register of Shipping, which is given below. These returns comprise all merchant vessels in course of construction in the United Kingdom, the British Dominions and Allied and Neutral countries. Warships and vessels built to the order of the Admiralty for other than mercantile purposes are excluded.

The tonnage under construction in the world during the quarter reached the enormous figure of 7,796,266 tons gross, of which 2,254,845 tons was in the United Kingdom, and 5,541,421 tons abroad. The record total for the world prior to the war was in June, 1913, when the tonnage under construction amounted to 3,446,588 tons. The work in hand in the principal shipbuilding districts of the United Kingdom was as follows: The Clyde, 754,000 tons; the Tyne, 434,000 tons; the Wear, 259,000 tons; the Tees, 224,000 tons; and the Belfast, 317,000 tons. Of the vessels building in the United Kingdom not less than 258 were of 5,000 tons and upwards, of which 22 were of over 10,000 tons each.

Of the tonnage building abroad, the United States has over 75 per cent., viz., 4,185,523 tons; then follow: the British Dominions (303,088 tons), Japan (254,835 tons), and Holland (182,308 tons). Only four other countries have over 100,000 tons of shipping in their yards.

If the figures given for the end of March are compared with the figures issued for the last quarter prior to the war, viz., June, 1914, it will be seen that an enormous increase has taken place in shipbuilding abroad. While the United Kingdom figures are about half a million tons higher than those for June, 1914, the tonnage building abroad is over 4,000,000 tons higher, and the increase is really under-estimated in view of the fact that the 1914 figures included nearly 640,000 tons building in Germany and Austria, while the present returns, of course, do not deal with enemy countries.

The wonderful development, due to the war, in the shipbuilding industry in the United States is shown by the fact that the tonnage now under construction in that country is more than 28 times the tonnage building in June, 1914.

A very striking feature is the increase in the operations of Lloyd's Register of Shipping. At the end of June, 1914, the new tonnage under the survey of the society amounted to 1,865,337 tons, a very high figure indeed, but the present total is not less than 4,597,615 tons, an increase of 150 per cent. on the 1914 tonnage.

MERCHANT VESSELS UNDER CONSTRUCTION

The returns compiled by "Lloyd's Register of Shipping," which only take into account vessels of 100 tons and upwards, the construction of which has actually been commenced, show that there were 657 merchant vessels of 2,254,845 tons gross under construction in the United Kingdom at the close of the quarter ended March 31, 1919. The particulars of the vessels in question are as follows, similar details being given for the last quarter for the purpose of comparison:

Description.	Mar. 31, 1919. No.	Mar. 31, 1919. Gross Tons	Dec. 31, 1918. No.	Dec. 31, 1918. Gross Tons
Steam—				
Steel	603	2,220,816	414	1,975,962
Iron	...	.....	...	.....
Wood and Composite	5	1,633	2	1,240
Total ...	608	2,222,449	416	1,977,202
Sail—				
Steel	49	32,396	8	2,750
Iron	...	.....	...	.....
Wood and Composite	...	.....	...	.....
Total ...	49	32,396	8	2,750
Total Steam and Sail	657	*2,254,845	424	1,979,952

* These figures for steel include 39 ferro-concrete barges of 27,366 tons and 1 motor vessel of 200 tons.

The tonnage now under construction in the United Kingdom is about 275,000 tons more than that which was in hand at the end of last quarter, and about 375,000 tons more than the tonnage building 12 months ago.

Of the merchant vessels being built in the United Kingdom at the end of March, 523 of 1,841,724 tons are under the inspection of the Surveyors of "Lloyd's Register" with a view to classification by this Society.

OTHER DETAILS

The following details concerning the shipbuilding work of the United Kingdom during the past three months may be added:

During Quar. Mar. 31,1919.	Steam No.	Steam Gross Tons	Sail No.	Sail Gross Tons
Vessels commenced.	100	423,576	3	1,552
Vessels launched .	72	203,966	2	1,350

MERCHANT VESSELS UNDER CONSTRUCTION IN THE WORLD

(Allied and Neutral Countries)

Where Building	Steam No.	Steam Gross Tons	Sail No.	Sail Gross Tons
Utd. King. .	608	2,222,449	49	32,396
Other Countries	1,677	5,389,915	168	151,506
Total for the World ...	2,285	7,612,364	217	183,902

WORK IN HAND IN PRINCIPAL DISTRICTS

The following table gives the total figures for vessels now under construction in some of the principal shipbuilding districts of the country, as compared with those for the last quarter. Each district, of course, includes places in the neighborhood of the port after which it is named.

District	Desc.	Mar. 31,19. No.	Mar. 31,19. Gr. Ton.	Dec. 31, 18 No.	Dec. 31, 18 Gr. Ton.
Barrow, Maryport and Workington	(Steam..	7	27,095	4	25,880
	(Sail....	6	4,200	..	.....
	Total.....	13	31,295	4	25,880
Belfast and Londonderry	(Steam..	39	312,675	39	312,775
	(Sail....	7	4,750	..	.....
	Total.....	46	317,425	39	312,775
Glasgow	(Steam..	110	444,588	72	342,020
	(Sail....	6	2,430	6	2,430
	Total.....	116	447,018	78	344,450
Greenock	(Steam..	63	304,105	51	268,730
	(Sail....	5	3,500	..	.....
	Total.....	68	307,605	51	268,730
Hartlepool ...	(Steam..	19	75,600	19	77,200
	(Sail....	..	.....	..	.....
	Total.....	19	75,600	10	77,200
Hull	(Steam..	70	44,825	6	20,611
	(Sail....	..	.....	..	.....
	Total.....	70	44,825	6	20,611
Liverpool	(Steam..	20	35,585	13	34,360
	(Sail....	..	.....	..	.....
	Total.....	20	35,585	13	34,360
Middlesbro' and Stockton and Whitby	(Steam..	40	147,020	31	146,820
	(Sail....	2	1,400	..	.....
	Total.....	42	148,420	31	146,820
Newcastle	(Steam..	91	433,932	71	378,015
	(Sail....	..	.....	..	.....
	Total.....	91	433,932	71	378,015
Sunderland ..	(Steam..	59	259,467	54	241,175
	(Sail....	..	.....	..	.....
	Total.....	59	259,467	54	241,175

SIZE OF VESSELS UNDER CONSTRUCTION

The following table shows the vessels under construction in the United King-

dom classified according to gross tonnage:

Gross Tonnage		Number Steam	Sail
*100 and under 500	tons	158	6
500 " 1,000	tons	34	43
1,000 " 2,000	tons	46	..
2,000 " 3,000	tons	48	..
3,000 " 4,000	tons	52	..
4,000 " 5,000	tons	12	..
5,000 " 6,000	tons	150	..
6,000 " 8,000	tons	57	..
8,000 " 10,000	tons	29	..
10,000 " 12,000	tons	4	..
12,000 " 15,000	tons	8	..
15,000 " 20,000	tons	6	..
20,000 " 25,000	tons	4	..
25,000 " 30,000	tons	..	..
30,000 " 40,000	tons	..	..
40,000 tons and above		..	..
Total		608	49

*Vessels of less than 100 tons are not included in Lloyd's Register Shipbuilding Returns.

A NEW IDEA IN PUMP DESIGN

The accompanying illustration shows a pump, patented in the United States, and applied for in Canada.

It is the invention of Mr. A. E. Worster, of Vancouver.

The advantages claimed for it by the inventor are as follows:

Simplicity of construction.

Freedom from sedimentation, therefore adaptable for handling dirty gully water.

Cushioning valve, reducing wear.

Piston packing, although not shown, but can be provided suitable for whatever application desired.

Direct water passages affording better efficiency and avoiding clogging by foreign material.

Two tests, which were made under unfavorable conditions, viz.:

No packing used of any kind, either on piston or valves.

Pumping salt water and sand, and power of engine far in excess than required; with a straight drive, which should have been countershafted.

Description of Pump

Type: Single-acting ported piston; diameter of cylinder, 6.1-16 in.; stroke, 13.1-16 in.; displacement per stroke, 377.1 cu. inches, equals 1.36 Imperial gal.

Arrangement of Apparatus

Pump was belt driven from a steam engine and was set 9 ft. 6 in. above suction level, drawing water through 16 ft. 6 in. of 3-in iron pipe set vertically. The discharge was carried through 101 ft. 6 in. of 2½ in. fire hose into a tank, the point of discharge being 2 ft. above the pump.

Trial No. 1

Duration, 3 minutes.

Number of strokes, 120.

Total displacement ....163.2 Imp. gals.

Water discharged as measured at tank ..145.5 Imp. gals.

Equals ..... 47.8 gals. min.

Volumetric efficiency $\frac{143.5}{163.2} = 87.9\%$

Total Head

Static suction head	9.5 feet
Friction of 47.8 Imperial gals. per minute in 16.5 ft. of 3 in. pipe	.3 "
Static discharge head	2.0 "
Friction of 47.8 Imp. gals. per min. in 101.5 ft. of 2½ in. fire hose	3.4 "
Velocity head	Negligible
Friction in pump itself, estimated	.5 "
Total	15.7 feet

Trial No. 2

Duration, 3 minutes

Number of strokes, 127.

Total displacement .... 173.7 Imp. gals.

Water discharged as measured at tank ... 147.9 Imp. gals.

Equals ..... 49.5 Gals. min.

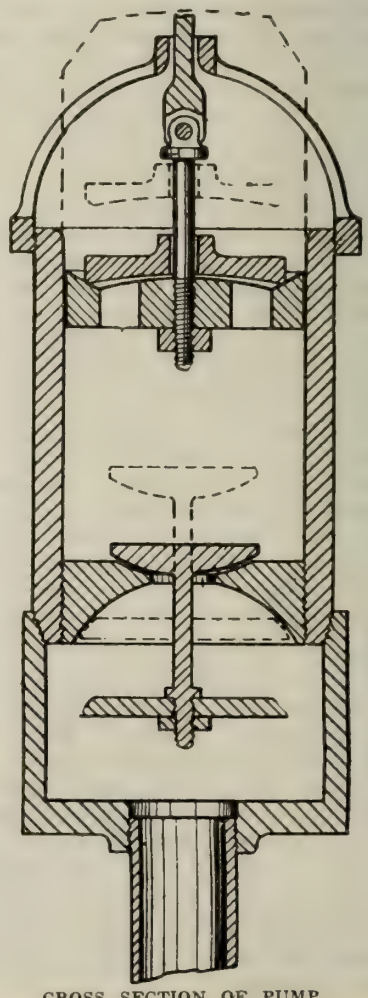
Volumetric efficiency $\frac{147.9}{172.7} = 82.6\%$

Total Head

Static suction head	9.5 feet
Friction of 49.3 Imp. gals. per min. in 16.5 ft. of 3 in. pipe	.3 "
Static discharge head	2.0 "
Friction of 49.3 Imp. gals. per min. in 101.5 ft. of 2½ in. fire hose	3.7 "
Velocity head	Negligible
Friction in pump itself, estimated	.5 "
Total	16.0 feet

The above trials recorded and measured by

RICHARD E. COLE,
M. Inst. M. & C. E.



CROSS SECTION OF PUMP.

MERCHANT VESSELS UNDER CONSTRUCTION ABROAD

(Allied and Neutral Countries)

Countries.	Steamers and Motor Vessels. Steel. No.	Gross Tons.	Wood No.	Gross Tons.	Sailing-Vessels Steel. No.	Gross Tons.	Wood No.	Gross Tons.	Total No.	Gross Tons.
British Dominions - Canada										
Great Lakes..	34	69,795	..	.....	..	....	..	.....	...	.....
Coast	27	99,140	42	49,452	—	....	41	18,240	(	303,088
Other Dominions	10	46,866	18	16,987	..	....	12	2,635	(184	
China	5	14,700	1	800	..	.....	..	.....	6	15,500
Denmark	33	49,159	5	1,770	..	.....	..	.....	38	50,929
France	33	109,795	..	.....	..	.....	..	.....	33	109,795
Greece	1	900	1	600	..	.....	..	.....	2	1,500
Holland	87	182,308	..	.....	..	.....	..	.....	87	182,308
Italy	20	111,800	32	20,634	..	.....	7	2,600	59	135,034
Japan	68	250,485	32	4,350	..	.....	..	.....	74	254,835
Norway	49	62,196	13	4,865	..	.....	..	.....	62	67,061
Portugal	..	.....	..	.....	..	.....	31	13,440	31	13,440
Spain	38	121,569	..	.....	..	.....	3	716	41	122,285
Sweden	41	89,130	24	9,298	..	.....	8	1,695	73	100,123
United States										
Atlantic Coast	361	1,783,401	98	208,872	2	4,600	25	27,890		
Gulf Ports	30	1,783,401	98	227,800	1	4,500	35	70,740	1,155	4,185,523
Pacific Coast ..	141	826,670	214	528,450	..	.....	3	4,450		
Great Lakes...	155	377,340	..	.....	..	.....	..	.....	..	.....
Total	1,133*	4,316,064	544	1,073,851	3	9,100	165	142,406	1,845	5,541,421

The tonnage being built in the world at the end of March under the inspection of the Surveyors of Lloyd's Register, excluding vessels the construction of which has not actually been commenced and excludini all vessels of less than 100 tons, amounts to 4,597,615 tons.

*Including 17 ferro-concrete vessels of 42,609 tons.

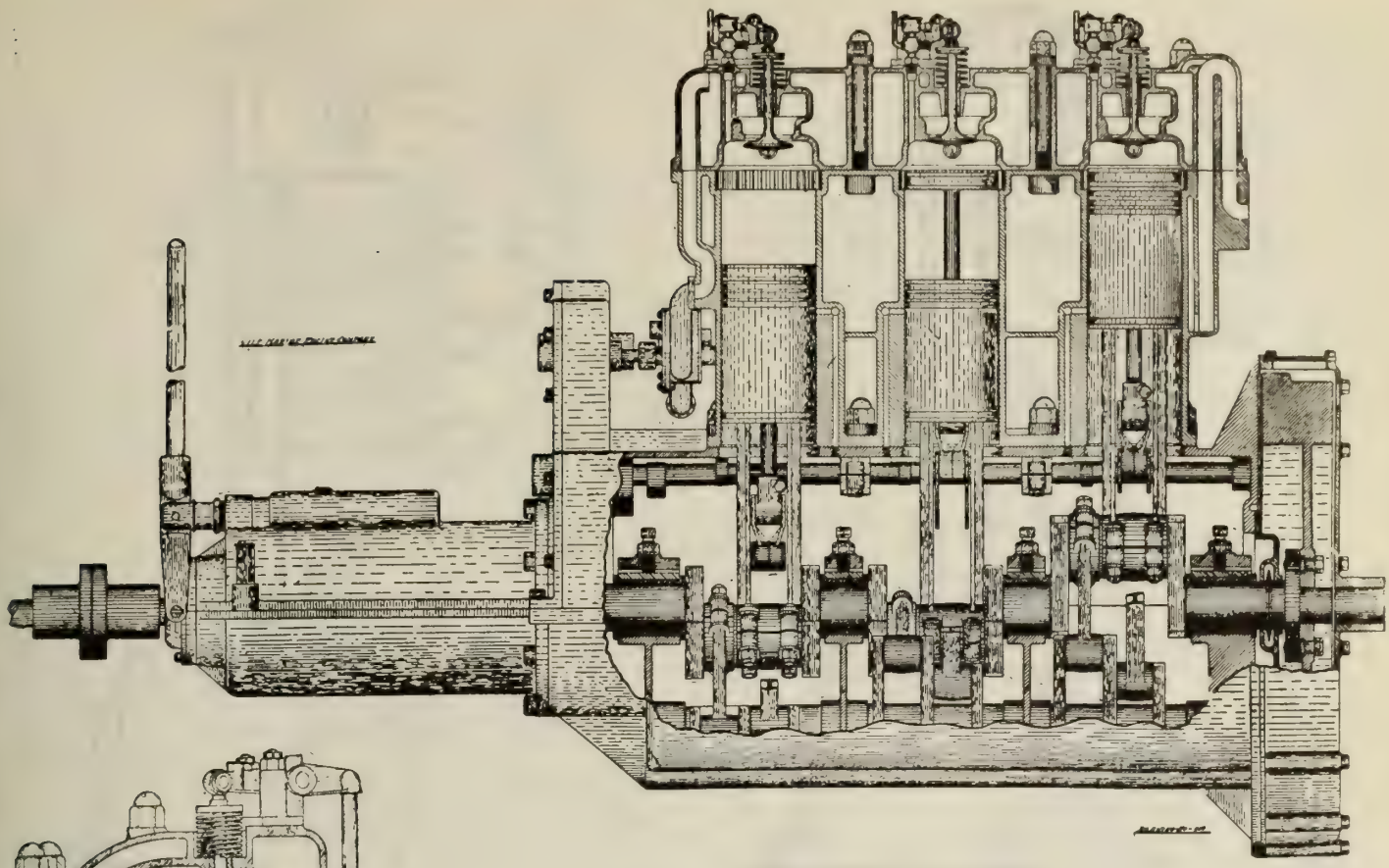
ENEMY STATISTICS

The "Neue Hamburgische Borsen-Halle" published on April 16 the following figures showing the tonnage lost to the German Mercantile Marine through the war:

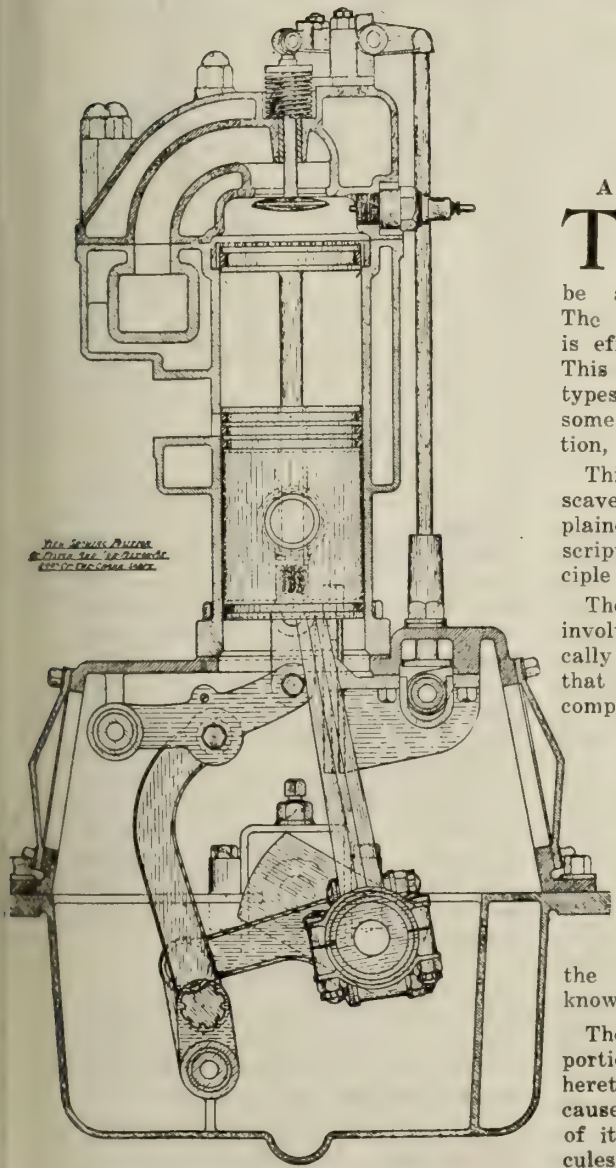
Seized by—	Tons net
United States	614,979
Portugal	241,798
England and Colonies	292,000
Brazil	256,196
Italy	139,844
Chile and Argentine	60,000
Russia	52,000
Uruguay	42,863
Peru	42,863
China	36,974
France	35,437
Hawaii	35,023
Greece	19,567
Siam	19,253
Cuba	17,750
Japan	4,117
Declared lawful prize	145,950
Captured by the Allies and sunk	310,000
	2,346,611

The present tonnage of the German Mercantile Marine is given by the same journal as 3,296,000 tons.

	Tons net	Tons net
Tonnage in 1914	.....	5,073,000
Less losses shown above	2,346,611	
Tonnage lost in countries allied to Germany	30,000	
War and marine losses in the North Sea	150,000	
	2,526,611	
	or, say	2,527,000
		2,546,000
Plus new tonnage		750,000
		3,296,000



CROSS SECTION OF ENGINE.



CROSS SECTION CRANK AT 240°.

A NEW COMBUSTION ENGINE

THE Gile engine is an internal combustion engine based on an entirely new principle, which can be applied to all power purposes. The preparation of fuel for combustion is effected within the cylinder itself. This has heretofore been done by other types of engines outside the cylinder by some vaporizing device working by suction, compressed air, or artificial heat.

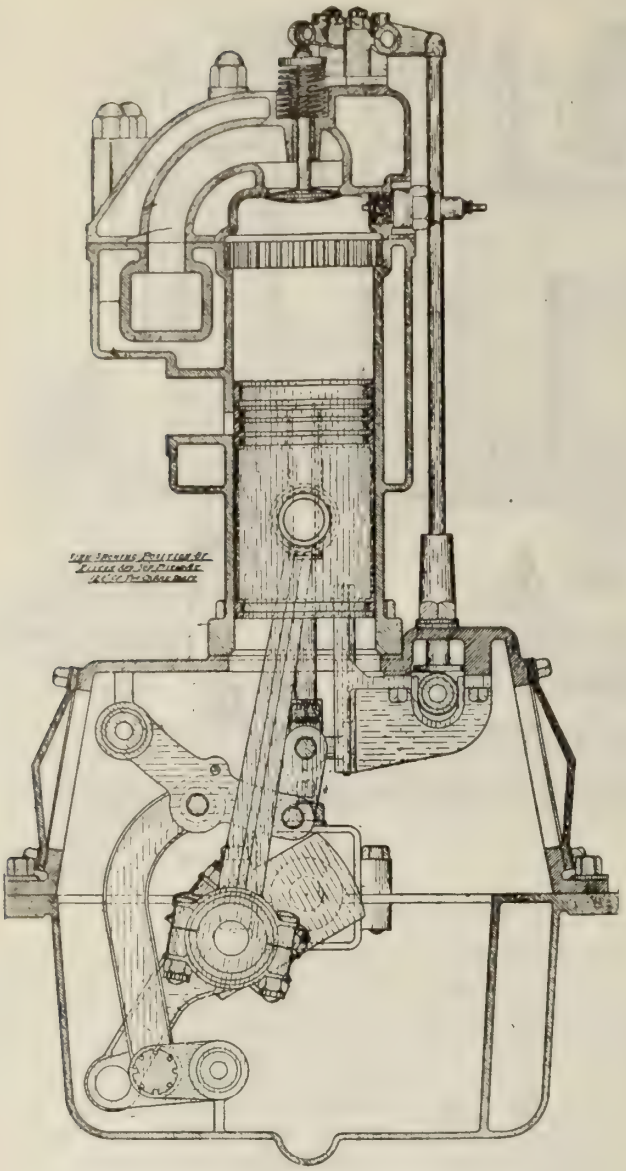
This engine has a perfect suction and scavenging stroke, which will be explained under the heading, "A Brief Description of the Cycle of this new Principle Engine."

The fundamental and new principles involved are that this engine mechanically mixes the fuel in the cylinder so that it is instantaneously prepared for complete combustion, a result which has been heretofore impossible to obtain in any other type of engine. By forcing the charge of compression around the sub piston head through a series of small flutes or restricted passages to the combustion chamber against the cylinder head like so many jets of steam, the Gile engine produces a perfectly homogeneous mixture of the highest explosive pressure ever known, in proportion to the compression.

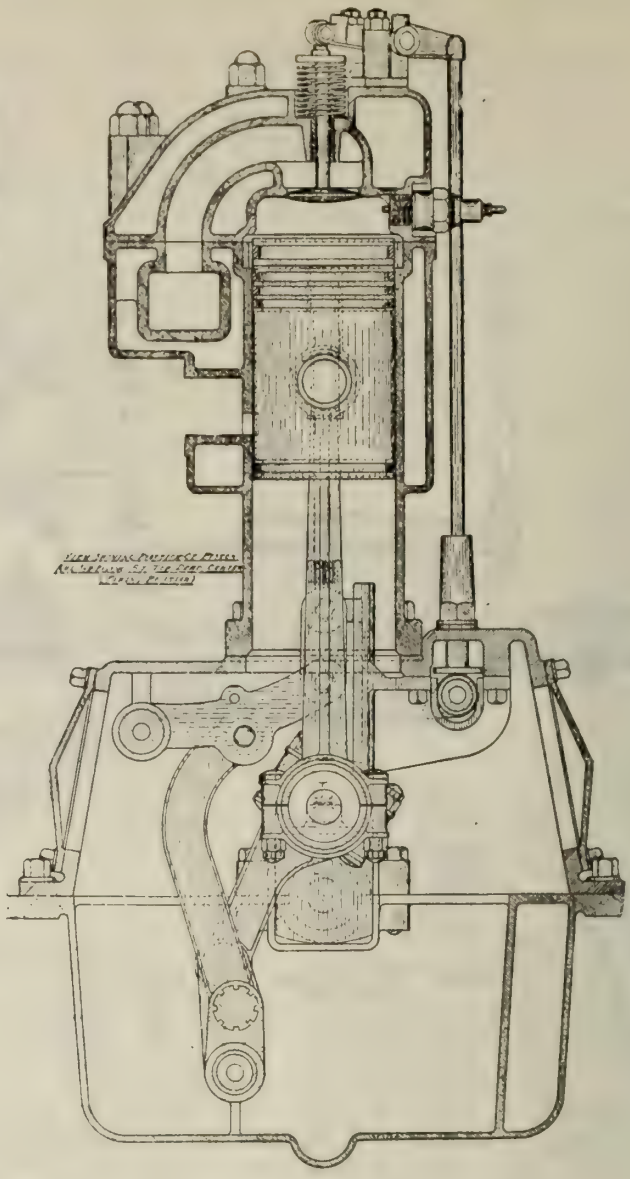
The result is that a much larger proportion of air is used than has been heretofore known in engine practice, because each molecule of fuel is assured of its complementary number of molecules of air for perfect combustion of highest efficiency; hence it is not surprising that the engine produces much higher initial pressure, and that the usual exhaust and water jacket losses, which in other types of engines are largely due to slow and incomplete combustion, are practically eliminated, while carbonizing of the fuel, even of kerosene, so troublesome in other types, is unknown in the Gile engine.

No fire gets by the exhaust valve. The temperature at the outer side of the exhaust valve is not more than 500°F. when the manifold is removed and a thermometer is inserted to the bottom of the valve housing close to the valve itself. In other types the temperature at this point is between 1200°F. and 1700°F. It is evident from this condition that the greater part of the fuel energy usually lost through the exhaust is here saved and converted into power. Repeated tests have shown that the water used and B. t. u.'s consumed do not exceed one-half of that known to be required by other types. The reason is plain. The combustion consumes all fuel elements and nothing is left clinging and burning on the cylinder wall after the power stroke is completed, and the new cool charge coming in immediately absorbs a large portion of the heat left from the preceding explosion. As a consequence, the Gile engine develops twice as much H. P. as a four cycle type of the same bore, stroke and revolutions per minute, with a fuel consumption of about one-half a pound per H. P. hour.

But the most remarkable feature of the Gile engine is that it burns kerosene as readily as gasoline, with standard



CROSS SECTION CRANK AT 120°.



CROSS SECTION CRANK ON TOP.

equipment and without preheating. The fuel is drawn cold from the carburetor, driven through flutes in the cylinder walls, compressed, and fired by a spark, as in the case of gasoline; in fact, in changing from gasoline to kerosene and vice-versa, no change in the engine or in adjustment is necessary. No hot plate or similar device is used on the engine, yet observation and chemical analyses of the exhaust gases show substantially complete combustion of kerosene as well as of gasoline.

The Principle

In the preceding cut the main piston and sub piston in cylinder No. 1 are shown at top dead centre, with gas compressed in combustion chamber above sub piston ready for explosion.

The main and sub pistons both travel in the same direction during the power stroke at the same rate of speed without relative movement until they have reached a point where main crank is within 45° of bottom dead centre, at which point exhaust valve opens.

Immediately after the exhaust valve opens, the sub piston is gradually stopped by the rocker arm movement which is controlled by a crank on the main shaft, and begins its return stroke, scavenging the cylinder and at the same time drawing in a fresh charge of fuel from the carburetor through intake ports which have been uncovered by the continued downward travel of the main piston.

During the time piston has travelled from the bottom dead centre on its return stroke to a point where intake ports are closed by main piston, the sub piston reaches the end of its upward travel, thereby causing a full charge of fresh fuel to be drawn into the cylinder between main piston and sub piston before intake ports are closed.

The sub piston remains practically stationary in this position until the main piston has completed its cycle and meets the sub piston.

By the continued upward travel of the main piston after the intake ports are closed, the fuel which has been drawn in between the two pistons is transferred during compression stroke to the combustion chamber above sub piston, through the flutes in the cylinder wall which extend from top of cylinder downward to a point below sub piston head, leaving flutes open below the underside of sub piston, the exhaust valve having closed previous to the transfer of the fresh charge through flutes to the combustion chamber.

When the main crank has reached top dead centre, the fresh charge has been compressed ready for explosion in the combustion chamber above sub piston, and both pistons have resumed their normal positions ready for the next power stroke.

The Dominion Towing and Wrecking Company, of Midland, has been incorporated with a capital stock of $250,000, divided into 2,500 shares of $100 each, to carry on a general wrecking and towing business.

Findings of the Admiralty Court

"Princess Sophia" and "War Toronto" Cases

"Princess Sophia"

The report of Hon. Mr. Justice Morrison, of the Supreme Court of British Columbia, who was appointed a commissioner to inquire into the loss of the Canadian Pacific Railway Company's coastwise steamship "Princess Sophia" in Alaskan waters on October 24, 1918, when all on board, including 289 passengers and the ship's crew of 61, perished, has been submitted to the Honorable the Minister of Marine and Fisheries, and is printed herewith. It will be seen from the report, which is signed by Hon. Mr. Justice Morrison, and Captain E. Martin, C.M.G., R.N., and Captain John D. MacPherson, Wreck Commissioner of British Columbia, as assessors, that the conclusion from the evidence was that the ship was lost through peril of the sea and the master of the vessel, Captain Locke, is exonerated from blame. No blame is attached to the owners or agents of the steamer, and it was shown that she was seaworthy and well equipped in every way. The following is the report in full:

"VICTORIA, B.C.,
"March 27, 1919.

"The Honourable the Minister of
Marine and Fisheries, Ottawa.

"I beg to submit the following report, with all exhibits attached, pursuant to the scope of the Commission issued to me as Commissioner, and Captain E. Martin, C.M.G., R.N., and Captain John D. MacPherson, Wreck Commissioner of British Columbia, as Assessors, dated the 3rd day of January, 1919, to inquire into the loss of the British steamship *Princess Sophia* on the 24th of October, 1918.

"Owing to the fact that the ship was lost in Alaskan waters, outside the Canadian jurisdiction, and that all the witnesses who were in a position to describe the conditions existing in the vicinity of the wreck at the times material to the inquiry were residents of Alaska, we had difficulty in making much progress at the several sittings held at Victoria and Vancouver, at which we exhausted all the evidence of the few witnesses who voluntarily came within the jurisdiction. After that it was deemed advisable to proceed to Juneau, Alaska, at which point we were advised by the American authorities there, the remaining witnesses would be available.

"Sittings were therefore held at Victoria on the following dates: January 10th, February 10th and 11th, March 10th, 13th and 20th, and at Vancouver on January 31st, and at Juneau 26th and 27th of February.

(Sgd.) AULAY MORRISON, J.

"The *Princess Sophia*, whose official number is 130620, was one of the coasting fleet of steamboats owned by the Canadian Pacific Railway Company, and plied between Victoria, Vancouver, and Skagway, Alaska, and intermediate points, carrying passengers and mails.

"She was built at Paisley, Scotland, by Bow, McLaughlin & Co. in the year 1912, and was a single-screw, triple-expansion, oil-burning steel steamer, registered at Victoria, B.C. She was 366 nominal horsepower, 245 ft. 2 in. long, 44 ft. 1. in. beam, and 24 ft deep. Gross tonnage. 2,320 tons; and registered, 1,446 tons.

HAD 289 PASSENGERS

"She arrived in due course of her schedule time at Skagway, Alaska, on the morning of the 23rd of October, 1918, and left on her return voyage about 10 p.m. (Alaska time) of that day, also in due course of her schedule time, carrying very little cargo, 289 passengers, and 61 of a crew. She had her full complement of officers and crew. She was in charge of Captain Locke, an experienced officer; and the other officers were properly certificated, efficient, and experienced in those waters.

"The ship was seaworthy and well found in every respect. The weather at the time of her departure from Skagway was fine. It appears, from the information gathered from wireless messages picked up, that she struck Vanderbilt reef about 2 a.m. (Alaska time) on the 24th October, 1918, a distance from Skagway of 54 miles (Parenthetically, it may be here stated that there is an hour's difference between Alaska time and British Columbia time).

Vanderbilt reef, which lies in latitude 58: 35:2 north, longitude 135:00:30 west ,and one mile and a quarter off the line of her course, is a small projecting reef well out in the centre of the southern extremity of Lynn canal, about equi-distant from both shores, some 3¼ miles; the nearest lighthouse being that of Sentinel Island, 4 miles south; the reef is submerged at high tide, and is marked by a can buoy.

"The various distances along the line of her course from Skagway to Juneau are as follows:—

Skagway to—	
Eldred Rock lighthouse	30
Point Sherman lighthouse	38
Vanderbilt reef	54
Juneau	100
Sentinel Island lighthouse	58

"From the lighthouse records it would appear that she must have encountered heavy squalls of snow before she reached Eldred rock, 30 miles from Skagway, with a strong northerly wind, which condition continued until about six o'clock that morning, the 24th, as appears from the following summary, taken from the lighthouse records at these points: Eldred Rock lighthouse — Snowing from 11.10 a.m. 3rd to 6 a.m. the 24th; clear from 6 a.m. the 24th to 1 p.m. the 25th; snowing from 1 p.m. the 25th to 8 a.m. the 27th. Sentinel Island lighthouse—Snowing from 8.15 a.m. 23rd to 6.50 a.m. the 24th; clear from 6.50 a.m. the 24th to 12.10 p.m. the 25th; snowing from 12.10 p.m. the 25th to 3.40 a.m. the 27th.

"From that hour, as appears from the evidence of those standing by, the weather moderated in the vicinity of the reef, and remained so until early in the afternoon of the same day—the 24th—during which period passengers could have been transhipped to the several craft standing by and landed without very much, if any, risk of life.

"During the later afternoon of the 24th the wind again freshened, and at 4.45 p.m. Captain Locke wired the *Cedar* that it was impossible to get passengers off, owing to the high seas then running, but that probably they could be taken off next morning. From then on, and during the following day, the 25th, it appears that the vessels which stood by during the 24th were unable to render any assistance. Captain Troup (who is the manager of the British Columbia Coast Steamship Service of the Canadian Pacific Railway Company) at Victoria, in the meantime, was endeavoring to ascertain the exact condition prevailing and on the 24th wired Captain Locke inquiring what assistance he was getting and asking what disposition he had made of the passengers. This wire was not delivered till the morning of the 25th.

"The following craft were standing at different hours during the 24th:—

1. SS. *Peterson*—Arrival 9 a.m. Oct. 24th; departure, 8 p.m. Oct. 24th; officer in charge, Capt. Stidham.
   (a) Character, U.S. harbor boat.
   (b) Motor power, steam.
   (c) No wireless.
   (d) Speed, about 10 knots.
   (e) Capacity, 150-200 passengers.
   (f) Length, 85 feet.
   (g) Number in crew, 10 persons.
2. *Estebeth*—Arrival, 10 a.m. Oct. 24th; departure, 5.30 p.m. Oct. 24th; officer in charge, Capt. J. V. Davis.
   (a) Character, Mail boat for Skagway and Sitka.
   (b) Motor power, gas.
   (c) No wireless.
   (d) Speed, 8¾ knots.
   (e) Capacity, 85-150 passengers.
   (f) Length, 65 feet.
   (g) Number in crew, 3 persons.
3. *Amy*—Arrival, 11.20 a.m. Oct. 24th; departure, 6.45 p.m. Oct. 25th; officer in charge, Capt. E. A. McDougal.
   (a) Character, ferry boat for Alaska Mining Co.
   (b) Motor power, gas.
   (c) No wireless.
   (d) Speed, about 6 or 7 knots.
   (e) Capacity, approximately 150 passengers.
   (f) Length, 65 feet.
   (g) Number in crew, 5 persons.
   (h) Life-boats, 2 boats.
4. *King and Wing*—Arrival, 6.20 p.m. Oct. 24th; departure, 3 p.m. Oct. 25; officer in charge, Capt. J. J. Miller.
   (a) Character, Seattle fishing boat.
   (b) Motor power, steam.
   (c) No wireless.
   (d) Speed, about 6 or 7 knots.
   (e) Capacity, 100 passengers.
   (f) Length, about 50 feet.
   (g) Number in crew, 22 persons.
5. SS. *Cedar*—Arrivals, 8 p.m. Oct. 24th and 4.55 a.m. Oct. 25th; departures, 9 p.m. Oct. 24th and 1.40 p.m. Oct. 25th; officer in charge, Capt. John W. Leadbetter.
   (a) Character, U.S. lighthouse tender.
   (b) Motor power, steam.
   (c) Equipped with wireless.
   (d) Speed, 11½ knots.
   (e) Capacity, 400 passengers.
   (f) Length, 200 feet.
   (g) Number in crew, about 40 persons.
   (h) Tonnage, 1,341 gross tons.
   (i) Power, 1,300 horse-power.
   (j) Life-boats, 4 boats.
6. *Lone Fisherman*—Arrival, 3.30 p.m. Oct. 24th (Sentinel Island only); officer in charge, Capt. C. R. Duffy.
   (a) Character, Juneau ferry boat.
   (b) Motor power, gas.
   (c) No wireless.
   (d) Speed, 9 knots.
   (e) Capacity, 200 passengers.
   (f) Length, 62 feet.
   (g) Number in crew, 2 persons.
7. *Sitka*—Arrival, 4 p.m.: left Friday; officer in charge, Capt. Momiss.
   (a) Character, gas boat.
   (b) Motor power.
   (c) No wireless.
   (d) Speed.
   (e) Capacity, 100 passengers.
8. *Elsinore*—Arrival, 7 p.m. Oct. 24th; departure, 10 p.m. Oct. 24th; officer in charge, Capt. Abrahamson.
   (a) Character, gas boat.
   (b) Motor power.
   (c) No wireless.
   (d) Speed. 6 or 7 knots.
   (e) Capacity.
   (f) Length.
   (g) Number in crew, 2 persons.
9. *Atlas*—Arrival, 12.15 Oct. 26th; officer in charge. Capt. Thomson.
   (a) Character, gas boat.

"The *Princess Sophia*, during the time that she was visible, appeared to be resting firmly on an even keel. As near as can be estimated, taking the wireless mesages as a guide, the ship must have been forced off the reef about 5.15 p.m. of the 25th, it being then dark, and the snowstorm at its height, when she apparently foundered immediately, leaving no survivors.

WERE NO SURVIVORS

"Next morning, the 26th, her position was indicated by a few feet of her foremast pro-

jecting above the surface of the water a short distance from the south end of the reef. There being no survivors, it is entirely a matter of conjecture as to how she came to leave the reef after being apparently firmly held thereon for 38 hours, during which there were two periods of high water, and each succeeding day the tides were getting appreciably lower. However, this much seems to be reasonably ascertainable, from a study of the meteorological and tidal conditions prevailing at the time in the North Pacific and in the vicinity of Vanderbilt reef, that there was an abnormally high tide arising from various causes. There had been a recent succession of southeast gales in the North Pacific ocean, causing an influx of water into all the narrower waters of this locality. The northeasterly gale blowing at the time down the Lynn canal when she struck would have a tendency to raise the level of the water at the Vanderbilt reef, in seeking an outlet through the narrow and intricate channels there. There was a low pressure of air (the barometer reading 29·42), which, according to one school of theorists, causes a higher level of water. Another factor that would contribute to the ship being lightened is that her bottom, when she struck, may have been so damaged where she carried her oil fuel as to cause the oil to leak out. When she struck it was almost the top of high water with a rising barometer, the reef being submerged at that period of the tide. The margin of water required for absolute buoyancy, the ship being light, would not be very great. It seems, therefore, having regard to all these circumstances and conditions reasonable to assume that at high water on the afternoon of the 25th of October, 1918, the water rose to a sufficient level for her to become waterborne, and then she was swept off the narrow reef on which she had been resting, sinking immediately on the opposite side of the reef to that on which she struck.

"When the weather permitted of search being made for traces of any bodies or wreckage, a number of her boats were found considerable distances from the reef. The boats all had disengaging gear, but whether any of them got away from the ship with passengers aboard it is impossible to determine. Amongst the passengers were the captains, officers, and crews of several Yukon river steamers, coming outside for the season, navigation having closed on that river and lakes. There were also a number of men engaged in mining in Alaska and the Yukon, and doubtless accustomed to travel on this route. It is reasonable to assume that their views would prevail in forming any decision as to the desirability of landing of the passengers, did such a desire exist during the forenoon of the 24th.

"The evidence is that Captain Locke was under no restraint, dictation or interference in the navigation of his ship in any way by the owners, or their agents or servants. Owing to the conditions prevailing at the time, the cable and wireless services were very much impaired.

"THROUGH PERIL AT SEA"

"From the evidence adduced, the conclusion arrived at by your Commission is that the ship was lost through peril of the sea.

"As to why passengers were not landed is a matter of conjecture, but your Commission beg to submit that from the evidence of all the surrounding circumstances, such as the ship being staunch and well officered, other craft being in the vicinity and other ship approaching, the inhospitable shores and lack of shelter sufficiently near, the time of year and weather conditions, we are not prepared to find that it was unreasonable for Captain Locke not to land his passengers.

"In securing witnesses and affording other facilities in the course of our investigation we desire to note the untiring and effective services rendered by the Hon. Thomas Riggs, jr., Governor of Alaska, and his staff; and by Mr. W. C. Dibrell, the Superintendent of U.S. Lighthouse Service, 16th District, Bremerton Navy Yard, Washington; as well as that of other citizens of Juneau, Seward, and Fairbanks.

"All of which is submitted.

(Sgd.)

"AULAY MORRISON,
Commissioner.

"E. H. MARTIN,
Assessor.

"JOHN D. MACPHERSON,
Assessor.

"WAR TORONTO"

An enquiry was held on May 9th, 1919, to ascertain the causes of the grounding of the steamer "War Toronto," at a place near Cape St. Michel, on the River St. Lawrence.

The Dominion Wreck Commissioner presided, and was assisted by Captain Charles Lapierre, and Captain Charles Koenig, acting as nautical assessors. The vessel was a wooden steamer, built in Toronto, and was on her first voyage in command of Alfred John Lowe, holding Board of Trade certificate No. 019257. She was provided with all navigating instruments, and her compasses had been adjusted and found to be without deviation.

The master stated that from Toronto to Montreal he had found the steering gear stiff in operating, but not unusually so for a new ship. The pilot was taken aboard in Montreal, the weather being fine. The master was a stranger in these waters. While proceeding down the river his attention was called to a defect in the steering gear. The engines were ordered full speed astern by the pilot, but immediately after the ship grounded. The engines were kept going full speed astern, but to no avail. Soundings taken showed the vessel to be aground practically her whole length.

Assistance was procured and the ship was eventually floated on May 6th, 5 days after grounding. After floating a slight leak to the extent of about 1 inch an hour was discovered.

The helmsman stated that he was at the wheel from Montreal. He received the order to port a little. He then discovered that the wheel was free, and had no effect on the helm, and the ship almost immediately went ashore. Before the accident the ship steered nicely, the wheel being stiff, but not unusually so for a new ship.

The chief officer deposed that the anchors were all clear and ready to be let go, but that in this case it would have been useless, as, at the speed the ship was going, it would only have resulted in tearing the hawse pipe out of the ship, and the probable loss of the anchor and chain.

The pilot, J. B. Angers, 39 years of age, had been a pilot since 1908 and had never had an accident. He had noticed the ship canting a little to port and had given the order to port. The wheelsman had observed that the wheel was not working. He gave the order for full speed astern and hard aport, but the ship continued to cant to port and grounded.

The trouble was evidently due to a defective taper in the gear, which broke off, allowing the wheel to move round without working the gear. The court found in accordance with the evidence that no blame attached to pilot or officers of the ship, the accident being due to an untoward happening.

NOTICE TO MARINERS

No. 30 of 1919

(Inland No. 4)

All bearings, unless otherwise noted, are true and are given from seaward in degrees from 0° (North) to 360°, measured clockwise, followed by the magnetic bearing in degrees, in brackets, miles are nautical miles, heights are above high water and all depths are at mean low water.

ONTARIO

(68) Lake Superior—Thunder Bay—Port Arthur—Storm Signal Station Moved

New position of storm signal station.—The storm signals are now exhibited from a grey steel skeleton tower, 45 feet high, on the roof of the custom house at Port Arthur. The top of the tower is 127 feet above the level of the lake.

N. to M. No. 30 (68) 29-4-19.

Authority: Departmental records.

Canadian Naval charts: Nos. 114 and 101.

Publications: U. S. H. O. Publication No. 108A, 1906, page 83; and U. S. Lake Survey Bulletin No. 27, page 110.

Departmental File: No. 39114.

ONTARIO

(69) Kaministikwia River—Fort William—Lower End of Westfort Turning Basin—Temporary Buoy

Temporary buoy—A black spar buoy will, without further notice, be placed to mark the extremity of the small shoal extending from the south side of Kaministikwia river at the lower end of Westfort turning basin.

Lat. N. 48° 21 min. 9 sec., Long. W. 80° 17 min. 48 sec.

N. to M. No. 30 (69) 29-4-19.

Authority: Departmental records.

Canadian Naval charts: Nos. 114 and 101

Publications: U. S. H. O. Publication No. 108A, 1906, page 82; and U. S. Lake Survey Bulletin No. 27, page 108.

Departmental File: No. 38797.

UNITED STATES OF AMERCIA

(70) Lake Ontario, East End—Galloo Island Lightstation—Change in Characteristic of Fog Alarm

Position—On southwest end of Galloo Island.

Change in characteristic of fog alarm.—The fog alarm has been changed so as to sound one blast of 4 seconds duration every 30 seconds, thus:—

Blast	Silent interval
4 secs.	26 secs.

N. to M. No. 30 (70) 29-4-19.

Authority: U. S. Dept. of Commerce N. to M. No. 16 of 1919.

Eastern and Western Canada Marine Activities

May Correspondence

AT THE termination of the first month's operations in and about the Port of Montreal, the appearance of pre-war activity is again noted, and almost all of the regulations that have been part of the scheme for the past four years are disappearing and citizens are permitted to view the movements of the vessels as in days gone by. Many secrets of the closed period are now coming to light, showing the magnitude of the operations that had to be carried out without the knowledge of the general public; the patrolling of the entire harbor by means of specially appointed boats equipped with machine guns and powerful searchlights that were able to sweep the harbor front from end to end. The movement of troops from the port was among the more important details of the operations during the past several years, not only in the matter of Canadians, but large numbers of American, Russian and Chinese soldiers were embarked at Montreal. Another feature of the port's duties was in the handling of high-explosives in transit to Europe. On several occasions incipient fires required to be fought by the local authorities, but in no case did any of them get any great headway. Still another factor was the many vessels that arrived in the harbor that had had encounters with submarines on their way out from the European ports. Even yet there are several cases where sailors are still in hospital suffering from wounds that were obtained in accidents of this character, in many cases these events being entirely unknown to many of the ship's passengers.

The restrictions that have been in force during the period of the war have prevented the carrying out of many improvements in and about the harbor that had been planned prior to 1914, and for many reasons these developments had to be postponed until a more opportune time. This time has apparently now come and work has already commenced on some of the extensions that were part of the original scheme of the Harbor Commissioners. When these plans have matured and the work completed the port will be second to none in Canada and in many ways equal to the best on the American continent.

The first trans-Atlantic passenger vessel to dock at the local port was the Metagama that arrived here on the first Saturday in May, with a total passenger list of 1,625, of which a large number were soldiers and their dependents. This was her first appearance in the harbor for about two years, as she had been engaged in the transportation of troops to and from Halifax or St. John.

While to all appearances the arrivals at Montreal illustrate a condition of pre-war days, there is nevertheless a difference that is somewhat pronounced when a closer study is given to the vessels that are coming to the port. In order to take care of the Canadian trade that is likely to develop with the Southern European countries, the opportunity for which has been opened by the action of the Canadian Trade Commission, this body having arranged for a Canadian credit of $35,000,000, Furness-Withy Co., who cover a wide range of shipping operations, are prepared to give a monthly service to Greece, Roumania, and the Levant. McLean Kennedy Co. are likewise interested in this trade route, and the S. S. Jiul, operated by this company, will be one of several that will travel between Canadian ports and those of Southern Europe.

Italy is another country that will be represented in those increasing their trade with this country. Early in the month the steamer Principessa Christiania arrived in port, and on her initial trip from the local port will take a cargo of flour for Italy. The present operations of this vessel is typical of many others that have changed hands during the course of the war. Both Captain Gervlimich and Chief Officer Vidulich are Slavs, born in the vicinity of Trieste under the Austrian flag, and they now find themselves sailing an Austrian ship under the Inter-Allied flag, and the outcome of the war has virtually made them full-fledged subjects of the King of Italy.

Another sign of the times is shown in some of the names that appear on vessels that are arriving from time to time. Just recently a boat came to the Montreal harbor and on the bow was the name "Burgemeister Schroder" — nationality understood. The boat is one of a fleet of vessels handed over to Britain at the signing of the armistice, and she was at once put into service on the trans-Atlantic route under a Scotch crew from Leith. She is a vessel of about 9,000 tons and looks more like a huge yacht than a freight boat.

One of the German U-boats—the U-C 97—that has been loaned to the U. S. Government, is expected to arrive here in the near future on her way up the lakes. This boat is one of the latest types of German submarines and is one of those handed over to the British navy after the armistice.

The project to construct a tunnel under the St. Lawrence in conjunction with a terminal station in Montreal has met the approval of the Chambre de Commerce, on the recommendation of the Transportation Committee, which had been requested to investigate the proposal as advanced by the Montreal Central Terminal Company. The idea as outlined is to tunnel the river so that it would touch the very heart of the city and permit traffic from the south shore to be brought to a station to be located in the vicinity of St. Denis Street and Victoria Square. This project of the tunnel has been under consideration for a long time, not only as an access to all the railroads in Montreal, but also to the local interests of the immediate South Shore. An alternative plan to this method of connecting the city with the South shore is the building of a bridge across the river by the way of St. Helen's Island. The Federal Government has been asked to take steps toward the carrying out of this latter project, and in all likelihood one or the other of these intended developments will probably materialize during the coming season. Another means of joining the island with the mainland is in the construction of a bridge from Ste. Anne's to Vaudreuil, at the end of the island. If present negotiations between the municipalities and the Provincial Government are successful, this bridge will probably be constructed.

Still another possibility of a bridge is that under consideration by the Provincial Government, to construct a bridge across the Batiscan River at Batiscan. At present the crossing of the river is made by means of a single hand-propelled scow, and the capacity of this conveyance is only two automobiles at a time, and each trip consumes about half an hour. As this objectional feature is one of the chief drawbacks to this otherwise beautiful tourist's trip, the building of the bridge will mean much to the Province and the traveling public in general.

The actual inauguration of the Canadian Merchant Marine Service took place a few days ago when the Canadian Warrior, with 1,453 tons of cargo, sailed for Barbadoes, Trinidad and Havana. The cargo consisted of flour, cement, malt, oats, and lumber, and she will bring back a cargo of sugar from Havana. This vessel, which is intended for salt sea trading, was launched at the Collingwood Shipbuilding Co. Another of the Canadian Government ships will be ready to sail in a few days after taking on a general cargo for South America; this vessel is the Canadian Pioneer, constructed at the plant of the Canadian Vickers here in Montreal. The Canadian Ranger, also built at these yards, will shortly sail to Liverpool with a general cargo of refined sugar, beets and canned goods.

About the first of May the Canadian Vickers Co. launched the 8,000-ton deadweight steamer, "Canadian Seigneur," without the official ceremony that has accompanied previous events of this character. This is the fourth vessel of the Canadian Government's program to be launched at these yards. At the time of launching the 7,500-ton steamer "Sammanger" was lying in the harbor after completing four successful trips to Australia; this vessel was built last year at the Vickers yard and was in-

tended for Norwegian interests, but handed over to Furness, Withy and Co., and this firm is still operating her.

The eight vessels being constructed by Fraser, Brace and Co. for the French Government are rapidly nearing completion, three of them are now lying in the canal and being fitted out with engines and other equipment. Work on the other five hulls is proceeding smoothly and it is anticipated that all of these will take the water toward the end of June. Three of these are in the basin and the other two are on the upper level, but it is expected that all will be in readiness for taking the water at the same time.

The steamer Glen Allen is now being fitted out by Messrs. Forrest, Jackson and Forrest for ocean service. She was previously operating on the Great Lakes, but has been taken over by the Kirkwood Steamship Co., who are inaugurating a freight line between Montreal and Chicoutimi.

BRITISH COLUMBIA NOTES

Gradually the regular Pacific Ocean trade routes are being reopened. Almost every week brings news that another line has prepared for a resumption of pre-war service, and not a few new companies are branching out into trans-Pacific commerce. The British companies, notably the Canadian Pacific Ocean Services, the Holt (Blue Funnel) Line and the Harrison Line, have re-established regular sailings with augmented fleets. The Japanese shipping companies, which profited greatly by the war, realize the strength of the competition that has now returned to the field and in an effort to hold their own are planning to expand their service to meet the requirements of the new period.

In Japan the war boom has been followed by a peace slump, and as the shipping situation is gradually recovering its equilibrium, the Nippon Yusen Kaisha, Japan's premier ship company, is taking steps to revise its policy and shipping schedules. As a first step it is reported that the company has decided to release all the vessels chartered since the outbreak of war. As a matter of fact, about one-half of the chartered bottoms have already been released and the management is continuing to let out other vessels still on the chartered list. Announcement that the Nippon Yusen Kaisha intends to suspend the extra service between Japan and Australia, in addition to the special Port Said and Mediterranean services, is significant that the company will concentrate on trans-Pacific trade, and in this it will come into direct competition with the British-Canadian lines.

The Osaka Shoshen Kaisha, one of Japan's largest shipping concerns, pursued a different policy to that of the N.Y.K. by building ships rather than chartering. During the present decline in freight rates and the reduction in cargoes, the Osaka company is regretting that it ever adopted such a policy. The new ships are becoming something like a herd of white elephants, while the N.Y.K. is resorting to the simple expedient of releasing its chartered boats.

The United States Shipping Board will also invade the trans-Pacific fields, according to Dudley W. Burchard, in charge of divisional operations of the Northwest district. Mr. Burchard announces that the board will inaugurate an Oriental steamship service embracing a sailing from Seattle every three weeks and from Portland every six weeks. This service is destined to provide for the new steel steamships now under construction in the Northwest, and will provide new routes when the flour shipments have been taken care of in the next few weeks. At present three ships are being prepared to take flour to the Atlantic and possibly to European and Mediterranean ports.

Several other American companies, privately owned, are placing ships in the trans-Pacific routes. The Pacific Steamship Company (Admiral Line) has been operating for the past two years, and while its vessels are small and comparatively slow, it has enjoyed considerable success.

The steel car-ferry Canora, to be operated between Port Mann on the British Columbia mainland and Patricia Bay on Vancouver Island is at last placed in service after undergoing extensive repairs at Yarrows, Ltd., where she has been lying ever since coming to the coast from Port Levis, her port of construction. On her first trip she will bring electrical machinery for the equipment of the ferry slip at Patricia Bay. The Canora is fitted with three separate tracks and is capable of handling twenty-one freight cars. She is able to make the Port Mann-Patricia Bay run in six days.

The French owners of the power schooner Stasia, which was built in 1916 in Victoria by the Cameron-Genoa Mills Shipbuilders, Ltd., have gone to court over the sinking of the vessel in Shanghai harbor, according to news brought here recently. In the meantime the vessel has been raised and is being repaired. The Stasia has had the most eventful career of any British Columbia-built craft and all within the short space of two years. On the voyage across to China from this province she was forced to put into the Hawaiian Islands, leaking, and on entering a Chinese port a few months later she collided with a couple of river boats and sent them to the bottom. She had also trouble with her steering apparatus and when she finally tied up in Shanghai at the wharf of the Shanghai Dock & Engineering Company she caught fire. The dock company, fearing destruction of their own property, ordered a gunboat to sink the Stasia and the task was promptly achieved, with no little difficulty. Now the owners of the vessel contend that there was no need for sinking the Stasia and that they should have been consulted first, in any case.

There will be no Grand Trunk Pacific service to Alaska this year, it being the intention of the company to confine its steamers to the British Columbia coast. The present semi-weekly service with the steamships Prince Rupert and Prince George will be maintained between Victoria, Seattle, Vancouver, Ocean Falls, Swanson Bay, Prince Rupert and Anyox. Business between these ports has increased substantially recently.

The Cholberg Ship Company sent its first vessel into the water a few days when the 1,500 ton wooden schooner Gunn was launched. She is the first vessel ever constructed on the British Columbia coast for Norwegian registry. Mrs. Hansen, wife of Captain H. F. Hansen, of Porsgrund, Norway, who has two ships of the same type as the Gunn building at the Cholberg yard, acted as sponsor for the ship.

The first trial trip in connection with the Foundation Company's shipbuilding program will be held June 1, according to the plans announced by Bayly Hipkins, Pacific Coast manager and fourth vice-president of the company. He says that progress has been satisfactory at the Ogden Point assembling plant, at the entrance to Victoria harbor, and sees no reason why the contract should not be completed on schedule time. The contract calls for the completion of twenty wooden steamers by the end of the present year. Delivery of the first boiler units has been promised by the Vulcan Iron Works, of Vancouver, by May 20. The machinery will be landed at the outer wharves by scows and with the powerful hoisting gear located there the heavy boilers and engines will be lowered directly into the hold. To facilitate the delivery of the Scotch marine boilers which have been delayed in transit from the United Kingdom to the Vulcan plant, a satisfactory arrangement has been arrived at whereby the Willamette Iron Works of Portland, Ore., which also holds a contract for boilers, will divert furnaces built in the United States to the Vulcan Iron Works.

Mr. Edward E. Jenkins, assistant to Mr. Hipkins in the management of the Foundation Company's activities on the Pacific Coast, has taken over control of the Victoria plant of the company, succeeding Paul B. Thompson, who has been transferred to Seattle, where he takes charge of a special department designed to speed up deliveries of equipment and materials.

Salvaging of the engines from the auxiliary schooner Janet Carruthers, wrecked on the beach near Gray's Harbor, Wash., has been completed. The wreck was purchased by J. H. Price, Victoria shipbuilding man, formerly president of the Cameron-Genoa Mills Shipbuilders, Ltd. Mr. Price claims that the hull of the vessel can be saved as well as the engines and he intends to attempt the job. The Janet Carruthers

was loaded with lumber, and the cargo is now being removed.

According to Captain Robert Dollar, president of the Canadian Robert Dollar Company, and pioneer of Pacific shipping men, the scarcity of cargoes from Oriental ports to this coast is becoming pronounced. "When Japanese freighters take the chance of coming all the way to our coast in ballast with no advance charter arrangements seeking cargo in competition with American shipping, you can count upon it that there is little to be had in the way of business in the Orient," he says.

Captain Edward Beetham, R.N.R., for several years marine superintendent for the Canadian Pacific Ocean Services trans-Pacific liners, has been appointed general superintendent of the organization with headquarters at Vancouver. Capt. Beetham was formerly in command of the company's trans-Pacific liners, and he brought the big Empress of Russia out from Liverpool. He was appointed marine superintendent in 1913.

Another step in the protracted litigation between the B. C. Workmen's Compensation Board and the C.P.R. in respect to the loss of the Princess Sophia was taken May 4, when the majority judgment of Chief Justice Macdonald, of the Court of Appeal, holding that the Compensation Board benefits do not apply to the dependents of the crew of the steamer, was filed, together with the dissenting judgment of Mr. Justice McPhillips. The judgment will be appealed to the Privy Council.

There seems to be good foundation for the reports that continue to circulate here in well-informed circles to the effect that the Federal Government is to establish a naval dry dock at Esquimalt, after all. This question has been in doubt for years, even though the project was originally provided for in the terms of Confederation. The attitude of the Union Government, as stated not long ago by Hon. Frank B. Carvell, Minister of Public Works, was that the dock should be built by the Dockyard Subsidy Act. Private interests were urged to take over the job on this basis and among those who expressed readiness to do so were Messrs. R. P. Butchart, formerly Pacific Coast director of the Imperial Munitions Board, chief of the I. M. P. shipbuilding program on this coast, and in private life a cement magnate, and Mr. Harry F. Bullen, formerly part owner of the ways at Esquimalt, now owner of the Yarrows plant, and latterly manager of the B.C. Salvage Company. There was some hitch in the plans, however, and since then efforts have been made to get the Dominion Government to carry out its original pledge to build a naval dry dock. It is now generally understood that the negotiations have assumed an extremely hopeful stage, and a definite announcement on the subject is expected at any time.

LAUNCH OF THE "CANADIAN TRADER"

The Port Arthur Shipbuilding Company successfully launched the Canadian Government's steamer "Canadian Trader" on May 5th last.

This is the first of the six steamers that this firm is building for the Department of Marine. She will be completed about the first week in June, and the "Canadian Sailor" will be completed in two or three weeks after her sister.

The "Canadian Trader" was, by request of the Department of Marine, christened by Mrs. A. W. Roberts, wife of the president of the Port Arthur Board of Trade. The vessel is of the full sized canal type, her capacity being 3,400 tons. She is single decked, with straight stem, semi-elliptical stern, built on the transverse system with poop, bridge and forecastle. The principal dimensions are as follows:

Length overall, 260 feet; length B.P., 251 feet; breadth moulded, 40 feet 6 in.; depth moulded, 23 feet.



THE "CANADIAN TRADER" AFLOAT.

The vessel is built to Lloyd's requirements for classification of 100 A1, and is fitted out to meet the requirements of the British Board of Trade.

The propelling machinery, is placed amidships, and consists of triple expansion, inverted vertical, reciprocating engines with cylinders 20½ inches, 34 inches and 56 inches, with a stroke of 40 inches. With steam these engines are capable of developing about 1,500 horse power.

The auxiliary fitted includes feed pumps, evaporator with a capacity of 15 tons per 24 hours, independent air and circulating pump, auxiliary condenser, vertical ballast pump and auxiliary feed pump. Direct connected dynamo and high speed engine are fitted for the electric lighting.

Ashes are handled in the boiler room by a steam ejector.

The boilers are of the Scotch marine type, 15 feet diameter by 11 feet in length, carrying a working pressure of 190 lbs. to the square inch.

The Port Arthur Shipbuilding Company is well equipped for turning out the complete vessels, having extensive foundry and machine shops. This company has the distinction of having built the W. Grant Morden, the largest freighter on the lakes. It also operates a large and well-equipped dry dock, and is amply fitted for carrying out repairs at short notice. A contract for six trawlers has lately been completed, and the yard was kept busy during the war on steamers for the Imperial Munitions Board.

GREAT BRITAIN HELPS APPRENTICES

The Ministry of Labor makes the following announcement:—

The terms that the Government offer to assist apprentices who have had their training interrupted by service with the Navy, Army, or Air Force, and who have come back to civil life, have now been issued.

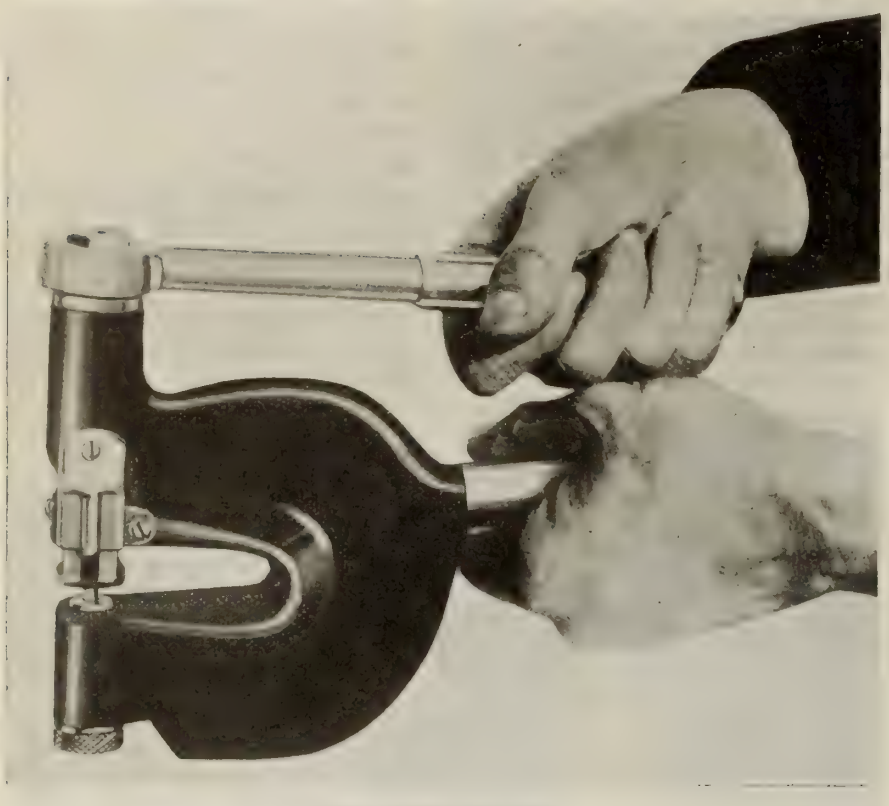
Employers or apprentices who desire information about the scheme can obtain it by applying to the nearest employment exchange in their neighborhood.

Each industry which proposes to take advantage of the Government's offer prepared, or is preparing, through its joint industrial council— or, where such does not exist, through some other body representative of industry, a special scheme dealing with the application of the general plan to its own needs.

Schemes have been completed for the engineering, furniture manufacturing, and shipbuilding industries, and other schemes will follow shortly. As soon as a scheme is approved, copies of it are sent by the employment exchange to every employer and secretary of a trade union concerned in the scheme, together with copies of the necessary application forms, and further copies are lodged at the exchanges for information of inquirers.

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement



THE "JIFFY" PUNCH.

A NEW TYPE OF SPEED PUNCH

The speed punch illustrated is known as the Jiffy punch, and is manufactured by the firm of Paul W. Koch & Company, Chicago, Ill. It is a powerful, compact and speedy little tool, being only 9½ inches long, and weighing only five pounds.

Owing to the small space taken up, it can be used in confined positions. It can punch holes of 5-32, 3-16, 7-32, and 1-4 inch in metal up to number 10 gauge. It requires but little oiling or adjusting.

It is made with a deep throat and one piece automatic disappearing stripper, giving a clear view of the punch and punch mark for the succeeding operation. Several sheets can be punched at the one operation. The power is directed to the centre by the crowned punches of floating type. The punch will not twist or turn in operation, thus practically eliminating punch breakage, and the holes are left clean without any burr.

It is claimed for this tool that fatigue to the mechanic is very much lessened, due to the fact that no long handles are used. This enables the operator to work close to the material, and follow the punch marks quickly and accurately. It weighs but little, and the action is quick and positive, it only requiring a half turn to the handle to drive the punch through the metal. The handle above the centre keeps the punch in an upright position automatically, and the punches and dies are easily changed. The punch can be clamped in a vise if desired. There are no pipes to fit or adjustments to make.

The punches are fully guaranteed, carefully tested, and packed in a neat labelled carton.

THE KELLER-MASTER "SURE-LOX" CHIPPING HAMMER

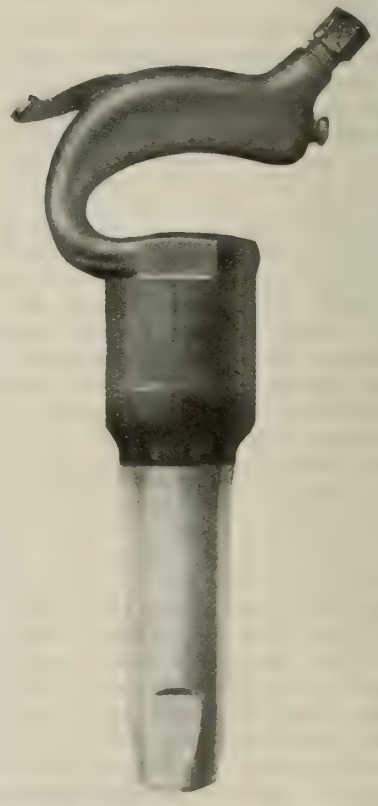
The Keller Pneumatic Tool Company, of Grand Haven, Michigan, general sales offices 20 E. Jackson Boulevard, Chicago, has recently placed upon the market a new type of pneumatic chipping hammer, the "Sure-Lox."

The noteworthy feature is the manner of locking the handle to the cylinder. The "Sure-Lox" locking device eliminates the old style clamp-bolt, which, in some cases has been found objectionable, especially for work in close quarters.

The manufacturers claim that the "Sure-Lox" method of attaching the handle is exceedingly simple and efficient. The handle is locked in a positive and rigid manner directly to the cylinder by means of a key inserted in the cylinder, engaging one of a series of slots in the handle. The key is held securely in place, and the entire locking arrangement covered by a neat spring clip. All projections or obstructions which might interfere with the convenient handling of the tool are eliminated. In this construction, it is claimed, all objections have been overcome which have heretofore characterized previous efforts to improve upon the clamp-bolt type.

Another exclusive feature claimed for the "Sure-Lox" is the extra long striking end on the piston, 5-8-inch instead of 3-16-inch, as commonly used in clamp-bolt types. The retaining wall in the cylinder is also correspondingly increased, making the hammer stronger and lengthening its life, as well as giving it increased adaptability for a wider range of work.

It is further claimed that the Keller-Master "Sure-Lox" chipping hammer represents the highest grade material and the most exacting standard of workmanship. All moving parts are hardened, ground and lapped to size. All parts are made accurately interchangeable. Handles are drop forged, oil and heat tested and sand blasted. Furnished with open or closed handle, piston type of throttle valve, round or hexagon bushing, eight or twelve-pitch thread on cylinder and handle, as specified in order. Made in ten sizes ranging from inch and one-quarter to four-inch stroke.



KELLER SURE LOX HAMMER.

Full particulars can be obtained by addressing the general sales office of the company.

LIBERTY 48 in. OPEN SIDE PLANER

THE Liberty Machine Tool Co., Hamilton, Ohio, have developed the open side planer shown in the accompanying illustration. The design embodies all of the advantages and features of the double housing planer in addition to handling work of unusual width. A notable feature is the rigid construction of the cross rail and column, making it possible to take any cut which the tool will stand, and adapting it to all classes of work required of a modern planer.

The cross rail is triangular shaped with a long and narrow guide extending upward on the front of the column. It is bolted and doweled to the triangular brace or knee. The triangular brace or knee extending to the rear of column, with tongue in rear tee slot, supports the cross rail, and is rigidly clamped with tee slot bolts in the side of the column, in addition to the rail clamp on the front of the column. This construction affords excellent clamping facilities, and the rail remains square with the table when bolts are loosened for raising or lowering the cross rail.

The column is of two post box type construction, extending to the floor. It is bolted and doweled to the side of the bed, and the wide base is arranged for bolting to the foundation.

The bed extending to the floor affords a solid foundation for the machine. The top is closed between the tracks except through the gearing section, which is reinforced by heavy girths. The tracks are wide and "V" shaped with an ample spread to eliminate any unnecessary overhang of the table, and are fitted with automatic oil rollers insuring proper lubrication. A place is also provided for the operator's tools.

The table is extra deep and heavily ribbed. "T" slots planed from the solid and reamed holes throughout the entire length of table, afford ample facilities for clamping work.

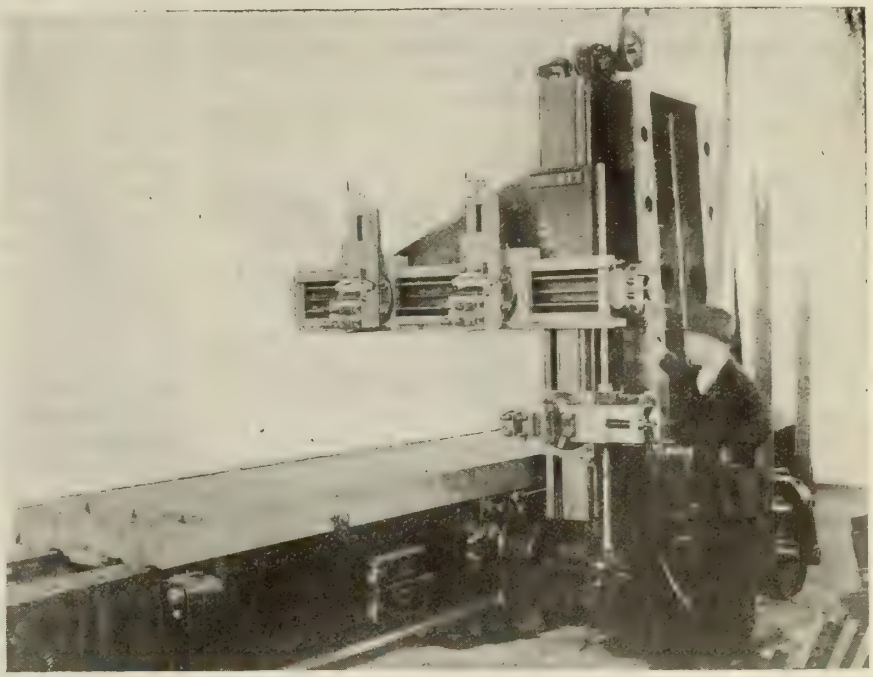
The running gear is placed inside the bed and is easily accessible from the top. The gears are pressed onto the hubs of the pinions relieving the shafts of all torsional strains. Heavy shafts support the gearing and journal in wick oiled bronze bearings. The pulley or driving shaft has an additional support outside of the pulleys.

The driving pulleys are made of aluminum with cast iron centres, increasing their strength and reducing their weight and consequent inertia at high speeds to a minimum which prevents excessive noise caused by the belts. The loose pulleys have wick oiled bronze bushings and solid web instead of arms to insure safety of operator.

Wide belts insure ample driving power. The shifting mechanism shifts the belts quickly and quietly. The entire mechanism is enclosed, avoiding the accumulation of dirt on the cam and other moving parts. The belt arms are adjustable to keep the belts in the proper position at all times and they have an additional support on the pulley bracket, relieving the fulcrum stud of a bending strain. By means of shifting levers on both front and rear sides of the machine the operator can control the motion of the table without walking around the planer. A safety lock secures the shifting mechanism and prevents accidental starting of planer table.

The patented feed is a decided improvement over the old style arrangements, and has the following advantages:

1. The operator can control or change the feed on cross heads at any time without stopping the machine or disturbing the feeds on either right or left side heads or vice versa.
2. All parts are well protected, yet easily accessible.
3. Convenient location of all operating handles and knobs.



OPENSIDE PLANER

4. The amount of feed is indicated by a dial conveniently located, enabling the operator to set the feed to the proper amount to suit requirements.

The rail heads have long and wide bearing surfaces on the cross rail and are made right and left for close range. They are graduated for swiveling up to 90 degrees in either direction, and have automatic feeds in all directions, operative from either end of the cross rail. The down feed screws under strain, are in tension instead of the usual method of construction. The slides are hung on ball bearings. Binder screws are provided on both saddles and slides. Micrometer adjustments are provided on all vertical and horizontal feed screws.

The power elevating device is located on the top of the column. A long handle on the rear side of the column operates a saw tooth clutch for raising or lowering the cross rail. The handle must be held in position while operating and any obstruction will instantly disengage the clutch, thus avoiding any breakages. All gears are idle when not in use.

The side head is mounted on the front of the column, the same as our standard planer, avoiding unnecessary overhang of the tool, which is brought up close to the point of support. It is properly counterbalanced and can be moved below the top of the table when not in use. The patented feed, micrometer collars, and control handles, are all conveniently located on the heads and move up and down with same. They are graduated for swiveling up to 90 degrees in either direction. Binder screws are provided on both saddle and slide. The tool block is fitted with a self-releasing spring plunger.

The countershaft is equipped with Hyatt Roller Bearings throughout, and all pulleys are properly balanced, insuring continuous operation and delivering the maximum power to the machine. The only attention they require is lubrication three or four times a year.

When it is desired to use this machine as a double housing for head planer, the left-hand housing and head can be attached at any time, as the machine is arranged for same. The machine can be arranged for either belt or motor drive. All parts are made to jigs and are absolutely interchangeable. The unit system of parts makes it possible to attach any additional unit, such as heads, or various motor or belt drives, at any time, after the planer is installed.

WELLAND.—The Imperial Oil Company are about to build a plant for handling their product, at a cost of about $40,000. From Port Colborne comes the news that the potash plant that has been under consideration by the Canada Cement for the last three years will be proceeded with. The cost will be about $500,000.

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The Loss of the Princess Sophia

IN another place in this magazine will be found the result of the Admiralty Court enquiry into the loss of the "Princess Sophia" on the Alaska Coast last October.

It will be remembered that at the time of the accident, statements were made by an eye witness of the wreck that the Captain of the "Princess Sophia" refused to make use of the services of the attending vessels, stating that he could not do so without orders, and that he had wirelessed to Vancouver for instructions.

What the actual reasons for not transferring the passengers during the comparatively fine weather when the "Cedar" and "King & Wing" were standing by will never be known, as no one was left to tell it. However, the passengers being to a great extent seafaring men, and well acquainted with those waters, the court took the view that their opinions as to the desirability of transfer would carry a good deal of weight. The opportunity to make the transfer went with the freshening of the wind on the afternoon of the 24th and from then on the possibility of rescue was remote.

The most satisfying part of the judgment is that the court finds that the captain was under no restraint, dictation or interference in the navigating of the ship by the owners' agents or their servants.

The court also found that taking into account that the ship was well equipped, and well officered, and the number of craft in the vicinity that it was not unreasonable on the captain's part to keep his passengers on board.

It was a case where an extraordinary combination of circumstances occurred to upset the best judgment of those responsible for the safety of the passengers. From the position of the vessel on the reef, where she lay on an even keel, and the fact that she had gone ashore on the top of high water, the probabilities of her floating off were perhaps never considered, and it is reasonable to think that had it not been for the extraordinary meteorological and tidal conditions she would have remained hard and fast till every one had been removed.

The Seamen's Conferences

THERE have been held during the past few months, a number of meetings known as International Seafarers' Conferences. The inception and aims of these conferences are of interest to everyone concerned in maritime matters.

The object of these meetings was to make it possible by combination of the various branches of the seafaring profession to retain the advantages that had been gained during the war. With the approaching passing of State control, it was feared that some shipowners would make an effort to place wages and conditions of service on the old basis, especially when the release of a large number of officers from Government service would perhaps make the supply exceed the demand.

In order to combat these tendencies, a combination of interests was necessary and out of this need grew the series of conferences, the latest of which was held recently in Paris. The branches of the profession represented included navigating and engineer officers, sailors and firemen, cooks and stewards.

The result achieved has been the adoption of a joint Seafarers' Council, which will control every grade of seafarers. It is felt that by representing all classes both owners and men will benefit, the owners by having only one body to deal with. It is said that a majority of the officers are in favor of this scheme, but it must be a pretty hard pull for some of them to identify themselves with the lower ranks for the good of the whole profession. That there is a real need for some means of protecting the interests of the seafaring man, no one who has any knowledge of the subject will doubt for a moment. While there are many owners who are quite awake to the spirit of the times, there will always be a few who will still look on the

sailor as a necessary evil, to be kept down as far as possible.

The officers and men working together, and using their power wisely, cannot help but benefit themselves and the shipping business generally.

A Wonderful Record

AT a "Victory Dinner" given recently to the staff of his firm by Sir William Beardmore some astonishing figures were furnished.

The turnover of the company during the war period was no less than £68,275,000, and the wages paid out amounted to £18,500,000. No less than 1,100,000 tons of steel, including 17,700 tons of heavy armor plate, and 24,000 tons of bullet-proof material for the protection of armored cars, mostly tanks. Forgings amounted to over 11,000 tons, included shafting for warships, and large quantities of torpedo air vessels for destroyers. About 1,000 mines were made, and naval shells to the number of 11,500,000 which varied in size from 18-pounders to 15-inch. Four thousand, six hundred and seven guns with all their mechanism and fuses to the respectable total of 1,171,000.

At the Dalmuir shipyard they turned out 50 complete tanks, before they had to stop this work to concentrate on destroyers and submarines. They also produced 73 vessels of various sizes, with a displacement of 120,000 tons, and engines of 687,000 I.H.P. They overhauled and refitted 20 warships, built 650 airplanes, from baby Sopwiths of 80 horsepower to Handley-Page bombers of 2,000 horsepower. At Inchinnan they built three Admiralty warships, and they have on hand there two airships, the largest of which will have a capacity of 3,000,000 feet.

At the opening of the war, they employed 11,080 men, and when the armistice was signed they had 42,500. In 1914 the total wages averaged 22,800 pounds, and in 1918 the weekly average was 145,000 pounds.

This is a stirring record of the effort put forth by one firm in the crisis of the country's life, and fully justifies the words used by Lord Weir, "An amazing contribution to the supply of war material to every one of our fighting forces."

Shipbuilding and Steel Plate

THE shipbuilding campaign in Canada will be gone on with. That much is certain from statements made in the House at Ottawa. Recently Hon. C. C. Ballantyne, the Minister of Marine, announced that the Government proposed to place with yards requiring business enough additional orders for ships to keep them employed for the balance of this year and probably into 1920. The boats are to be operated on both oceans and on the Great Lakes and St. Lawrence route in connection with the national railways. Some members were inclined to suggest that the cost of the ships, $180 to $215 a ton deadweight, was excessive. The Minister, however, pointed out that Canadian prices were lower than those in United States by approximately $25 a ton, and that prices in Britain had trebled during the war. Mr. Ballantyne also announced that the contract for the purchase of steel plates from the Dominion Iron and Steel Company, which has been subjected to some criticism, would be modified in conformity with the present price of steel in the United States or cancelled, the company not having proceeded very far in the erection of its plant at Sydney, C.B.

The reference to the cancelling or changing of the contract for the rolling of ship plate by the Dominion Steel Corporation brings to mind a contract that was made during the war, in fact, it was sanctioned about the end of March, 1918. At that time four companies submitted propositions, some of them on short notice. The firms were the Dominion Steel Corporation, Nova Scotia Steel and Coal, Canadian Steel Corporation, and the Dominion Foundries & Steel, Hamilton.

The contract went to the Steel Corporation on the understanding that the Government was to purchase 250,000 tons of steel plate at 4.15c per pound, spread over a period of five years, with the option of increasing this amount if desirable. The cost of 4.15 is based on the ingot cost, and if that is not below $25 per ton then the company could claim 4.25c per pound for its plate. It is a safe guess right now that the Steel Corporation could never produce ingots at $25 per ton, as billets, which are quite closely related to ingots, are marketed at Pittsburgh now at $38.50 per ton, and it is safe to say that a new mill could not clear out that much difference in price.

The agreement also provided that rolling plate should begin 18 months from the date of the contract, which would mean that the plate mill should be in operation by the 26th of September of this year. The admission of the Minister of Marine that "the company had not proceeded very far in the erection of the plant" is equivalent to saying that it would be a year yet before there would be any plate rolled, or even longer. So if there is to be work carried on at once in the building of a marine fleet it is certain that the great portion of the plate, with the exception of what the Nova Scotia Steel and Coal Co. can roll, will have to come from U. S. mills.

It is urgent that this country should have tonnage at its disposal for carrying its exports and imports, and it is not well that construction should be delayed or held up until plates can be rolled here in sufficient quantities to meet the demand.

Selling the Wooden Ships

THE United States Government is asking bids for 431 wooden ships and 31 wooden barges, now in various yards throughout the country. Most of these are of the Ferris type, 3,500 tons, but there are a few of the 4,800-ton size. If desired by purchasers the boilers and engines, winches, auxiliary machinery, and rigging will be sold. The Government offer the suggestion that these hulls can be converted and made into sailing vessels instead of steamers, or used as barges. The possibility of fitting them with internal combustion engines is also referred to.

This reminds us of the time when the building of two thousand of these vessels were counselled, and we heard so much talk of a bridge across the Atlantic. The Shipping Board will no doubt find purchasers for these hulls, but if they get a price to cover 50 per cent. of the original cost they will be doing well.

New Dry Dock

THE Bethlehem Steel Corporation are considering plans for a floating sectional dry dock at its Fore River plant, Quincy, Mass. The dock would accommodate two 500-foot ships of 10,000 tons each, or one 18,000-ton ship of 700 feet. The dock will be available at mean low water for a vessel drawing thirty feet, and will be located to the right of the Fore River yard.

A New Ocean Flag

AN English paper notes the arrival in South Shields, at the mouth of the Tyne, of a vessel flying the new flag of Iceland. This is the first occasion of a vessel from Iceland flying a distinctive flag, as formerly all this country's ships flew the flag of Denmark. Iceland now has her own Parliament and all her ships will, in future, fly the red, white and blue ensign, which is said to be almost a facsimile of the British red ensign in design.

Boosting Philadelphia

ADDRESSES made before the Kiwanis Club recently by President Brush of the American International Shipbuilding Corporation, and Wm. J. Conlen, a noted admiralty lawyer, before the Philadelphia Credit Men's Association, urged the purchase of the Hog Island Shipyard. The possession of this land as a railroad terminal and shipping centre, would be the means of making Philadelphia a world centre for foreign trade.



The Secretary of the Guild Pays Visit to Ottawa

Captain Inkster Meets a Number of Members Representing Great Lakes Constituencies—The Views of the Guild Laid Before the Members—Favorable Reception—The Secretary's Report

CAPTAIN W. W. Inkster, secretary of the Canadian Merchant Service Guild, met by appointment the members of Parliament representing the constituencies of the Great Lakes. The meeting took place at Ottawa, the object being to enlist the support of the members in securing some necessary reforms for the benefit of the Mercantile Marine profession in Canada. Being requested by the members to state what, in his opinion, were the reforms required, Capt Inkster made the following statement:

"Gentlemen, I have been appointed to come before you on behalf of the Canadian Merchant Service Guild, and to lay before you the views of those who man our merchant fleet. Our object is to find, if possible, a way of enlisting the help of our members of Parliament in order that, through them, our seamen may be enabled to raise the Mercantile Marine profession in Canada to a higher standard of efficiency.

"The Canadian Merchant Service Guild is an outgrowth of the Imperial Merchant Service Guild, the institution that has done so much for the merchant service of the British Empire during the twenty-five or more years that it has been established. It is firmly established in New Zealand, Australia, China, India, South Africa, and other places, and has some of the greatest financial magnates of the British Empire working in its ranks to-day. It depends to a very great extent on our members of Parliament here in Ottawa, how much time must elapse before Canada can be forged into a link strong enough to connect up and form a continuous chain, for the protection and defence of the international trade and commerce of the British Empire.

"In England, for many years past, and at the present time, the Imperial Merchant Service Guild has had the support of members of the British House of Commons, and House of Lords. The executive officers of the Guild have from time to time held meetings with these members of the Legislature, to discuss measures of vital importance to the safety of life and property afloat, and to the building up of their international trade and commerce under the Red Ensign. These matters have then been placed before the House of Commons by the members, and legislation has been secured in this way.

"The purpose of this meeting, gentlemen, is to endeavor to make arrangements by which members of Parliament representing Great Lakes constituencies would, from time to time, meet the representatives of our seamen, and give them the benefit of their support in promoting legislation to the benefit of the merchant marine, and the country generally. If this can be arranged, your seamen will be forever grateful for your endeavor on their behalf." Some discussion followed Capt. Inkster's statement, the result being that the members present unanimously agreed to help the seamen in every possible way. They also suggested that there were many more members of the House who would be ready and willing to support any measures, having a tendency to raise the seamen's profession to a higher standard of efficiency.

It was arranged that when the Canadian Merchant Service Guild wished to send a representative to Ottawa on marine matters, Mr. F. F. Pardee would notify those members who had signified their willingness to assist in the work. The business could then be discussed conjointly with the Minister of Marine in attendance, and if the need arose, could be placed before the House by the members present. In consideration of the advanced stage of the session and the great amount of preliminary work required, it was decided not to proceed further for the present.

The members present at this interview were: F. F. Pardee, C. N. Smith, W. S. Middleboro, Dr. R. Manion, J. B. Tudhope, B. R. Hepburn.

Members of the Guild owe these gentlemen a very great debt of gratitude for the courtesy shown their representative on this occasion, and also for the whole-hearted support and assistance given to marine matters in general.

The secretary requests members of the C. M. S. G. in all parts of Canada to co-operate by interviewing members of Parliament from their constituencies, and on getting their consent to give a little of their time and support to reforms necessary for the best interests of our Mercantile Marine, report the same to the secretary, so that the names of such members may be added to our list. This will help with the preliminary work now under way very materially. Members should understand that the foundation has been laid and only with their co-operation and assistance can the building be carried on.

After this session your representative

paid a visit to J. G. McPhail, Commissioner of Lights; this gentleman seemed to be very anxious indeed to get all the information possible which would lead to the safety of our vessels and their crews, in so far as lights and signals are concerned.

The matter of relighting Otter Head and installing a flag signal, together with range light to make it a harbor of refuge in bad weather was taken up and discussed very thoroughly. Your representative was informed that this light would be in commission possibly about July, and the matter of installing a fog signal and range lights would be placed before the Lighthouse Board at their next session, but as the machinery for a fog signal would have to be made, shipped up there, and installed, it could hardly be in working order this season.

The matter of flash lights for gas buoys and ranges was discussed, and it was decided that a fixed light for a gas buoy or a range light was the proper system, and that the idea of, "Now you see me and now you don't," for a gas buoy or ranges does not conform to safe navigation.

Your representative was informed that from now on lighthouse keepers would be paid their salaries monthly instead of quarterly, as formerly. This will reduce a very great hardship which our lighthouse keepers had to put up with in the past, especially those who had families to support. The matter of it being compulsory for all isolated lighthouses to be attended by two light keepers, was also taken up.

The great trouble seemed to be that the masters and officers of our vessels did not seem to co-operate in the way of sending information in cases of neglect on the part of employees attending lighthouses, fog signals or gas buoys, and where the same could be placed to the greatest advantage. Until such co-operation became systematized it would be impossible for the Department to create an efficient service.

In view of the above the secretary would ask members of the Guild and others throughout the Dominion to report such matter to him at his address in Collingwood. The same will be placed before the proper authorities, and if not attended to, he will find out the reason and report to the C. M. S. G. at large.

The Department of the Naval Service Hydrographic office was then visited in connection with the charts of Quebec Harbor, Michipicoten Island on Lake Superior, which our seamen have been anxiously enquiring after for some months.

Capt. Anderson was in charge of this office at the time and by the number of plans, drawings, etc., in front of him his work must be long and arduous. However, he found time to discuss a number of interesting items in connection with our profession and promised that as soon as the chart of Quebec Harbor could be got ready a liberal supply should be sent to the Soo Lock office, that there might be no delay in getting the masters and officers supplied.

In closing this report your representative would say that he came home from Ottawa firmly convinced that the deplorable, stagnant, disorganized condition of our Mercantile Marine profession could never be improved until such time as the masters, officers and seamen of Canada organize and put themselves in a position to place the necessary reforms before the proper authorities in an intelligent, seamanlike manner. He would, with confidence, say from personal observation that you will find no one more ready to assist you in straightening out the terrible muddle you must deal with than those in charge of the different departments at Ottawa.

W. W. INKSTER, Sec. C.M.S.G.

THE "YARROWDALE"

It will be remembered that the British steamer "Yarrowdale," a vessel of 4,652 tons gross and 2,914 tons net, built by Messrs. W. Dobson & Co. at Newcastle in 1912, and owned by the Mackill Steamship Company, Ltd., of Glasgow, was captured in the Atlantic on Dec. 11, 1916, by the German auxiliary cruiser "Moewe" and taken into Swinemunde.

Subsequently the "Yarrowdale" was fitted out as a German commerce raider, and on March 16, 1917, when disguised as the Norwegian steamer "Rena," she was encountered to the northward of the Shetlands by his Majesty's ships "Achilles" and "Dundee," and, after an action lasting 48 minutes, sank with all hands.

The following letter has been received from Captain P. Smith, who was Master of the "Yarrowdale" for some months during 1915:—

"The question will often be asked by those who know something about shipping, 'How did the German Admiralty come to choose the steamship "Yarrowdale" for an ocean-going raider, seeing that she was simply a cargo steamer of a type common enough, and ont built for high speed?' As I had the pleasure of commanding the "Yarrowdale" for a period during 1915, I will try to answer that question by what I know of the fine qualities of the vessel.

"Her dimensions were as follows:— Length (b.p.) 300 ft., breadth 52 ft., moulded depth 29 ft. She was fitted with triple-expansion engines of 1800-2,000 i.h.p., driving a single bronze propeller. Her deadweight capacity was 7,750 tons.

"I think it is a great compliment to British shipbuilders and engineers that the Germans should have fitted her out as a raider, when they had so many fast steamers of their own laid up in their ports. No doubt, they found they had no steamer that could give a greater radius of action and keep the sea without bunkering for a longer period than the "Yarrowdale" could.

"Her most economical speed was an average of 10.5 knots on a consumption of coal of 25 tons per day of Welsh coal. but she had reserve power capable of driving her at over 13 knots when required.

"I have authentic information that the Germans got a speed of nearly 15 knots out of her when making for Germany after her capture in the Atlantic, and that is the speed she was going when H.M.S. 'Achilles' gave chase at 15 knots and overtook her so very slowly that the "Achilles" had to increase speed to 18 knots. It has been reported that the 'Yarrowdale' was a twin-screw steamer when sunk, but I am sure that is a misapprehension.

"I may mention that the "Yarrowdale" was built and engined on the Tyne, but designed on the Clyde, with successful improvements incorporated in design of hull and engines by the owners' superintendent.

"We want more vessels of the "Yarrowdale" type under the British flag to help us to maintain our position against foreign competition in the sea-borne traffic of the world."

Toronto. — Cargo-carriers that have slipped off Canadian ways during the last few months are now carrying goods across the seven seas. An instance of the significance of the enlarged wartime shipbuilding activities in Toronto, is afforded by a recent notification of the United States Navigation Company, that the new 100 A1 Le Quesnoy would soon commence loading for Constantinople, Constanza, Galata or other Black Sea ports. Le Quesnoy was built at the Dominion Shipbuilding Co. plant, at the foot of Bathurst Street, Toronto, and was launched last autumn. This vessel is 4,300 tons deadweight, and is a bulk cargo carrier of the improved Cunard type. Le Quesnoy left Toronto in December for the Atlantic, accompanied by tugs, which encountered rough weather before leaving Lake Ontario. Le Quesnoy completed its journey to Montreal and Halifax, and subsequently sailed for New York to enter the mercantile service.

Montreal.—The inauguration of a new steamship line from Montreal to Buenos Aires and Montevideo is announced by Messrs. McLean, Kennedy, Limited. The first sailing will be the Steamship Clan Keith, about 8,000 tons, due to arrive in Montreal May 5, to be followed by about monthly sailing thereafter from this port in summer and from St. John, N.B., in winter. This line will be known as the "Houston Lines" Canada-South America service, and will fill a want by Canadian exporters, who have hitherto been obliged to send their shipments through the port of New York.

The Cunard and other associated companies, it is understood, now have twenty-nine vessels in course of construction. Most of them are of the standard type, 20,000 tons, and built to carry both passenger and cargo. They are all being fitted with engines which can be driven either by oil or coal. The alternative is provided because of the uncertainty of readily acquiring the necessary oil supplies.

Educational Items for Future Officers

A Series of Questions and Answers on Subjects Pertaining to Seamanship—Rule of the Road—The Use of the Chart—These Articles Will Appear Monthly

Continued from last month's issue.

Rule of the Road

Question.—When two steam vessels are meeting end on or nearly end on, so as to involve risk of collision, which one keeps out of the way of the other?

Answer.—Each shall alter her course to starboard, so that each may pass on the port side of the other.

Question.—State clearly the only cases to which this rule applies.

Answer.—The only cases to which it does apply are, when each of the two vessels is end on or nearly end on to the other; in other words, to cases, in which, by day, each vessel sees the masts of the other in a line or nearly in a line, with her own; and by night, to cases in which each vessel is in such a position to see both sidelights of the other.

Question.—State clearly also the cases to which it does not apply.

Answer.—It does not apply by day to cases in which a vessel sees another ahead crossing her own course; or by night to cases where the red light of one vessel is opposed to the red light of another, or where the green light of one vessel is opposed to the green light of another, or a green light without a red light, or a red light without a green light is seen ahead, or where both red and green lights are seen anywhere but ahead.

Question.—When one of the two vessels has to keep out of the way, what is required of the other?

Answer.—She shall keep her course and speed with caution.

Question.—Is there any exception to this Rule?

Answer.—Yes, when two vessels find themselves so close that collision cannot be avoided by the action of the giving way vessel alone then the other vessel shall also take such action as will be best aid to avoid collision.

Question.—Are there any other exceptions to the Rule?

Answer.—Yes, article twenty-seven says a departure from the Rules may be taken in order to avoid immediate danger. Also article twenty-nine says nothing will exonerate you from neglect of any precaution which may be required by the ordinary practice of seamen and the special circumstances of the case.

Question.—When one vessel is required to keep out of the way of another what rule indicates the manner in which the manœuvre shall be made?

Answer.—Article twenty-two states every vessel that is directed by these Rules to keep out of the way of another vessel, shall, if the circumstances of the case permit, avoid crossing ahead of the other.

Question.—In the case of steam vessels, is any further obligation imposed?

Answer.—Yes, every steam vessel which is directed by these rules to keep out of the way of another vessel, shall, on approaching her, if necessary, slacken speed, stop, or reverse.

Question.—When is a vessel supposed to be an overtaking vessel?

Answer.—When she is coming up from any direction more than two points abaft the beam.

Question.—Would any subsequent alteration of the bearing between the two vessels make the overtaking vessel a "crossing vessel" and relieve her from the duty incumbent on an "overtaking vessel?"

Answer.—No subsequent alteration of the bearing between the two vessels shall make the overtaking vessel a crossing vessel within the meaning of the rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

Question.——What is the rule for steamers approaching each other?

Answer.—When the two steamers are approaching each other so as to involve risk of collision, the steamer approaching from port to starboard keeps out of the way, and shall if necessary slacken her speed, stop, or reverse.

Question.—What is the required length of the sidelight screens and on what part of the vessel should they be placed?

Answer.—Sidelight screens shall project at least three feet forward from the light, and should be placed in the widest part of the vessel.

Question.—State under what circumstances a departure from existing rules is necessary?

Answer.—Due regard shall be had to all dangers of navigation and collision, and to any special circumstances which may render a departure from the existing rules necessary in order to avoid immediate danger.

Question.—You are in a sailing vessel and overtaking a steamer, what course has each vessel to follow?

Answer.—The sailing vessel keeps out of the way, the steamer keeps her course with caution.

Question.—The rules state one of the vessels has to keep out of the way, what has the other to do?

Answer.—Keep her course and speed with caution.

Question.—What is the exception?

Answer.—When two vessels find themselves so close that collision cannot be avoided by the action of the giving vessel alone, the other vessel shall also take such action as shall best aid to avoid collision.

Question.—What precautions should you take in thick weather, state the rule?

Answer.—Go at a moderate speed, keep a good look-out, and sound the fog-signal. Every vessel shall, in fog, mist, snow or heavy rain storms go at a moderate speed, having careful regard to existing conditions and circumstances.

Chart Questions

1. What is a chart?

Answer.—A survey of a coast or part of an ocean laid down on paper to enable you to navigate from place to place.

2. On what principle is the Admiralty chart laid out?

Answer.—The Mercator principle.

3. What is the Mercator principle?

Answer.—The meridian or longitude lines are the same distance apart at the top and bottom of the chart. The miles of latitude or distance increase in length north and south of the equator.

4. What is a true chart?

Answer.—The compass rose would be laid down from the true north.

5. What is a magnetic chart?

Answer.—The compass rose would be laid down from the magnetic north.

6. What is the difference between the true and the magnetic chart?

Answer.—The amount of variation in whatever the locality the chart may be for.

7. Why are there so many compass roses generally laid down on a chart?

Answer.—It is easier to find a course from one place to

another and tells you the amount of variation in the different localities.

8. What do you call the lines running north and south on your chart?

Answer.—Meridians of longitude.

9. What is the meaning of the word "meridian?"

Answer.—It means highest point.

10. What is the meaning of the word "longitude" with reference to the chart?

Answer.—It means hours, minutes and seconds, east or west from Greenwich.

11. Why do you call the lines running north and south, meridians of longitude?

Answer.—Because they pass through the highest points and tell the time east or west of Greenwich.

12. What is a meridian?

Answer.—A great circle drawn around the earth and passing through the poles.

13. What do you call the lines running east and west on your chart?

Answer.—Parallels of latitude.

14. Why are they called parallels?

Answer.—Because they run parallel to the equator.

15. Why are they called latitude lines?

Answer.—Because they tell you the latitude or distance, north or south from the equator.

16. Where does latitude commence and end?

Answer.—Latitude commences at the equator and extends 90 degrees north and south to the poles.

17. What is the equator?

Answer.—A great circle drawn around the earth at equal distance from the poles.

18. How many equators have we to deal with in navigation?

Answer.—Two.

19. Name them.

Answer.—The geographical and the magnetic equator.

20. Where is the magnetic equator situated?

Answer.—Half way between the magnetic poles.

21. What is the approximate position of the magnetic poles at the present time.

Answer.—The north magnetic pole is situated 70 degrees north latitude and the south pole about 73 degrees south.

22. What is meant by hemisphere?

Answer.—Half of a globular body.

23. Into how many hemispheres is this earth or globe divided?

Answer.—Two.

24. Where is the dividing line?

Answer.—At the equator; the starting point for reckoning latitude or distance.

25. How do you name these hemispheres?

Answer.—From the equator and north is termed the northern hemisphere. From the equator and south is termed the southern hemisphere.

26. How many sections are there to each hemisphere and how are they named?

Answer.—Each hemisphere has two sections divided by the first meridian or circle of no longitude and is named the north-western and north-eastern section of the northern hemisphere and the S. W. and S. E. sections of the southern hemisphere.

27. What is distance?

Answer.—The number of miles run north or south from the equator or a given point.

28. Where do you measure distance?

Answer.—On a graduated meridian.

29. Where are these graduated meridians found?

Answer.—On the side of the chart.

30. How would you measure distance between two places?

Answer.—Half on each side of the middle latitude.

31. How do you find the middle latitude between two places?

Answer.—Take the latitude of departure and destination. Add them together and divide by two. The remainder is the middle latitude.

32.—Why have you to measure distance this way?

Answer.—The world is longer than it is round and only measures 90 degrees north and south of the equator.

33. Could you explain this more fully?

Answer.—The world is first measured round the centre from east to west into 360 degrees, then, making the divisions the same distance apart, it is measured from the centre, north and south, but before the poles were reached the 90 parts had been used up proving that the world is not a true globe, so we come back to the centre and start over again, making each mile of distance or latitude a little longer than the one before it, so as to take in the space left at the ends, and still calling it 90 degrees from the equator to the poles.

34. Then, what would you be careful about in measuring distance?

Answer.—Measure from the side of the chart, abreast of where you are working and when measuring distances between two places go to the side of the chart half-way between departure and destination, take your miles half on each side and then step off from departure to destination.

35. Would a mile of distance be the same length on Lake Superior as it is on Lake Huron?

Answer.—No, it would be longer on Lake Superior as it is nearer the pole.

36. When would your miles of distance be all the same length?

Answer.—When running on a true east or west course, then your miles of distance would be the same length and should be measured according to the length of a mile in that latitude.

37. Where would a mile of latitude or distance and a mile of longitude measure the same length?

Answer.—On the equator.

38. What would be the length of a mile of longitude in 50 degrees north latitude?

Answer.—It would be shorter than a mile of distance as the meridians pass through the highest points and therefore draw in to nothing at the ends of the earth or the north and south true poles.

39. Then at the true poles, how would the time be divided?

Answer.—It would be noon at the North Pole the six months the sun is north of the equator and midnight the six months the sun is south of the equator. The same with reference to true South Pole.

40. Where do you measure longitude?

Answer.—On a graduated parallel.

41. Where do you find a graduated parallel?

Answer.—On top and bottom of the chart.

42. How would you know the top of the chart?

Answer.—By the latitude increasing to the top.

43. How would you name your latitude?

Answer.—All north of the equator would be north latitude and south of the equator would be south latitude.

44. How would you name your longitude?

Answer.—If the longitude marked on top or bottom of your chart is increasing to the west, then your position must be west of meridian of no longitude and should be named west. If it is increasing to the east it should be named east.

45. How many degrees of longitude are there?

Answer.—180 degrees west and 180 degrees east, making a total of 360 degrees.

46. If you wanted to get from 178 degrees west to 178 degrees east, how would you steer?

Answer.—By steering west you would increase your west longitude to 180 degrees, then decrease your east longitude down to 178 degrees east.

47. How many degrees of latitude are there?

Answer.—90 degrees north and 90 degrees south.

48. How many different lengths of miles are there?

Answer.—Three, the statute mile, geographical mile,

and nautical mile; put it sailor language and call it a sailor's mile, engineer's mile and farmer's mile.

49. What is the length in feet of these three different miles?

Answer.—The sailor's or nautical mile is 6,080 feet. Farmer's or statute mile 5,280 feet. Engineer's or geographical mile is disputed with regard to its length. It seems that different engineers have different opinions of its exact measurement.

50. What do the figures marked on the chart represent?

Answer.—The depth of water in fathoms at low tide, unless otherwise marked or indicated in writing on the margin of the chart.

51. What do the Roman numerals indicate you see marked around the coast line and harbors?

Answer.—The time of high water at full and change of the moon.

52. If you had no tide tables on board your vessel how would you be able to tell the time of high water?

Answer.—Add 47 minutes for every day that has elapsed since full or change. This will give you the P.M. time of high water for that day.

53. How would you find the distance you are passing a light or a point of land?

Answer.—Take a four-point bearing.

54. How would you take a four-point bearing?

Answer.—First take the bearing of the light or point when it is 4 points from the course you are steering, and the time, or reading from your log. Then run until it is 8 points from the course you are steering and the distance you have run is the distance you are away from the light.

55. How would you find the course to steer from this light or point to your destination?

Answer.—Correct the last bearing for deviation. If using a magnetic chart lay this bearing off from the light and take the distance you run between the bearing from the side of your chart and lay it off along this line. This will give you the ship's position. Then put one end of your rule on this position and the other at your destination. Move over to centre of compass rose, get the angle allowed for deviation and the remainder will be the course to steer. If a true chart allow variation.

56. How would you find your position on a chart by cross bearings?

Answer.—Take a bearing of two lights or points at the same time. If a magnetic chart, correct these for deviation; if a true chart, allow for variation, lay these two bearings off on the chart and where they cross will be the ship's position.

57. How would you find the ship's position from two bearings of one light?

Answer.—Take the bearing of a light or point, then run any number of miles suitable and take another bearing; allow for deviation and variation, as you are using a magnetic or true chart, lay these two bearings off from the light, then place your rule on the compass rose to correspond with the true or magnetic course you are steering. Now take the distance you run between the bearings until you come to the place where the dividers will meet from one to the other and you must have the position on your ship at the time you took your first bearing and also at the time you took your second bearing.

58. Have you any other means of finding your distance from a light or point?

Answer.—Yes, any double bearing will give you the distance you are away when you take the second bearing.

59. Can you explain how this is done?

Answer.—Take the bearing of a light or point, say one point from your course. At the same time take the reading of your log or time if you are sure of the speed your vessel is making, then run until the light or point is two points distant from your course. This would double your bearings, and the distance you have run is the distance you are away. When you take the second, allowing for the corrections of your compass; lay this bearing off from the light or point, take the distance you run between the bearings from the side of the chart, lay off along this line and you have the ship's position; take the true or magnetic course you are steering with the rules from the compass rose, move to this position and you will readily see just how far you will pass the light or point. Any double bearing will give the same results.

Ministry of Shipping Goes

GOVERNMENT control is not looked on kindly in Great Britain, and with the sigh of relief that goes up with the abolition of the Ministry of Shipping, at the end of June, fresh cause of alarm is discovered on the horizon. This is in the form of a rumor that when Sir Joseph MacLay retires from the position, the Minister of Ways and Communications, Sir Eric Geddes, is to move into the office thus vacated. This is causing some uneasy speculations as to whether Sir Eric will endeavor to interfere with the country's shipping, in virtue of his office.

Sheffield Goes Ahead

SHEFFIELD is getting over the throes of re-construction, and getting down to a busy peace-time basis. The light trades, as they are called, are getting large orders, and over fifty firms in these lines have made extensions to their premises. Orders are coming in from the British overseas Dominions, South America, and other quarters, for cutlery, tools, domestic utensils, building fittings, agricultural appliances, saws, edge tools and mining equipment.

A particularly interesting feature of the Sheffield industries is the way in which the Government, universities, and the industries themselves are co-operating in scientific and research work. Sheffield intends to retain her position in the metal world, and lead the rest.

Engineering Scholarships

LEADING shipbuilding and engineering firms in Great Britain are taking practical steps to encourage young men to qualify for the higher technical positions in the engineering world.

In the annual report of the Institution of Naval Architects, it is stated that Messrs. Cammel, Laird & Co., of Birkenhead, have offered a scholarship of one hundred and fifty pounds per annum to the institution. Another large firm, Messrs. John Brown & Co., have offered a sum of money, conditional on some other shipbuilders doing the same.

The sum offered is sufficient to enable a student to live in comfort while he is pursuing his studies, and is about three times the amount that has usually been offered in these gifts.

That $150 Bid

WITH reference to the report that the Submarine Boat Company has submitted a price to build eight 12,000-ton freighters at a cost of $149 per ton, made by the United States Shipping Board, an interesting situation has arisen. The Philadelphia *Record* publishes a statement that President Piez of the Emergency Fleet Corporation says that this is not a bonafide bid. He states further that on the present market price of material and labor no shipbuilder could build ships at that price.

It is suggested in some of the American papers that the statement as to the price was given out by the Shipping Board in order to influence other shipbuilders to lower their prices.

When Governments go into business strange things happen.

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

THE young men of our Canadian merchant service will find out sooner or later that the great tramp steamers on which they serve meet with emergencies that demand all the ingenuity of skippers and mates combined "and then some." One such problem is when a craft breaks down and requires a long tow by a vessel of a similar class.

Such knowledge as might fit into every puzzle the ocean presents is not procurable, but the energetic student can always forearm himself by studying the experiences and procedure of those who have laid down the marline-spike and picked up the pen.

First of all, please bear in mind that we are discussing towage under hard and unique circumstances—the ships involved having no adaptation for towing. Further, salvage towing has a direct connection with saving life and property, and is of the greatest value to crews, owners and underwriters.

A few years ago, whilst making the southern route from "Gib" to Hatteras in a floating box-car, we encountered the usual meteorological samples—short-lived half-gales and heavy swells from the N.W. Being ore laden, the grease and tar was actually washed out of our hatch covers through the "old girl" trying to bail the ocean in on one side and out on the other. When approximately half-way across, and about 1,600 miles from Bermuda, at 2 o'clock one morning, the forward look-out man edged up to the weather side of the bridge, lowered his head out of the breeze, and said quietly: "See that light to leeward, sir?" I answered by taking the binoculars from the box and finding the light in question was the then "Not under command" signal of 3 red vertical globe lights. The present signal is 2 red lights. Perhaps it should be explained that in tramps having no crow's nest on the foremast, the lookout man stands his watch on the lee bridge in dirty weather, as nothing but a well clinched rivet can hang on to the fo'c's'le head.

At once I rang down to the engineer, "stand by," and the moment the damper chains rattled, a request for "half-speed" followed, at the same time telephoning to the master in his berth. We soon were within hail with megaphones and found out that there was no life in immediate danger, but assistance in the shape of towing would be welcome, as the stranger had broken her tail-end shaft in the stern tube and was at the mercy of the elements, with no chance of making port unaided.

Towing in Mid-Atlantic

After arranging to hover around till daylight, and meantime getting all kinds of likely gear and junk from fore peak and boatswain's locker in readiness, we started the real work at 8 a.m. Both wind and sea took on a little more affable disposition, but the passing of the initial small lines by lifeboat was out of the question.

A coil of point line and a coil of ratline were bent together and a lifebuoy attached to the overboard end. By placing our craft ahead and to windward, the floating device was easily picked up by the brokendown ship and she at once bent on a new coil of 2 in. diam. manila. This working line we hove in and got it on the middle barrel of one of the after winches.

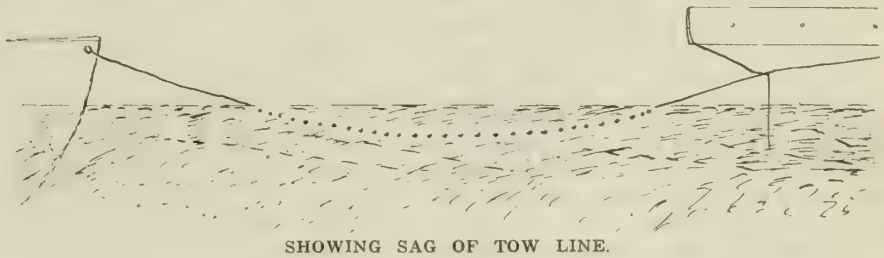
It will be well to say here that in all towing jobs one of the first things to be arranged is a definite code of signals between the two vessels. It can be by steam whistle, international code, or private code, but it must be adhered to absolutely, otherwise disaster is imminent. Another situation which must be rigidly organized is "stations." Any laxity on that point is fatal to good results. Remember that two vessels weighing each about 8 or 9 thousand tons are bobbing up and down within 200 feet of one another. In the present discussion our skipper stuck to the bridge with the steersman. The third mate stood on the wheel-box gratings, close to the taffrail, and every now and again shouted to the "old man" the distance in feet between the two craft, just as the lake mate does in canalling with regard to the ship's stem and the head locks.

The other two mates supervised the work on the poop and well-deck. Our chief engineer was not behind at his part, for he had ordered a double watch on the starting platform to give quick service till the towing became an accomplished fact. He (the chief) had spent part of the night making an accurate measurement of his bunkers and exchanging notes with the skipper, who had nearly worn a hole in the chart measuring distances to Yankee ports and the Bermudian reefs.

It was apparent that we could not tow from the poop, as that deck had quarter boats, davits, double emergency steering wheels, and the usual quadrant chains, buffers, lead blocks and awning gear. It was, therefore, decided to tow from the after-well deck pipe and bridle to poop bollards to prevent the hawser from getting under or athwart the counter where it might jeopardize the rudder or screw.

Our own heaviest wire was brought into the after well deck and the inboard end secured to the bollards on the port side. Then three round turns were wrapped around the main mast, just above the coat, and the eye and shackle passed out of the starboard quarter pipe and up on the poop. When the stranger's wire was hove in, the two were shackled together. The tricing lines or bridles were ordinary cargo whips of steel flexible wire and they simply kept the towing wire straight, as per illustration.

What has happened on board the stranger? She has simply bent her towing wire to her starboard cable, the same, of course, being unshackled from the anchor. After we signalled that the two wires were fast, the other craft eased out about 75 fathoms of cable with the windlass brake, and then signalled that, as far as she was concerned, the connection was made. The reader must bear in mind that during this ordeal the vessels have been anything but quiet, and the greatest tact and skill is required to keep clear of each other. Before any real strain comes on the towing line, have it well greased where the nip in the pipe will come, as there is considerable surge there.



SHOWING SAG OF TOW LINE.

Cautious Start

Now is the moment when an overheated captain or engineer can make a complete mess of otherwise good and sure work. With heavy compound engines it is sometimes tricky to get a slow start, but with three or four cranks in the pit, the initial towing should be fairly safe. It is not out of place to give the engineer six or more "dead slow" rings, with stop intervals between, before you get both vessels settled on their course. During this time, two or three argus-eyed men are watching the bridles, bollards, and mast turns in case weakness may show.

Whilst the mate, carpenter and boatswain watch events, the engines should

only go as far as "half-speed" for at least half an hour, and when eventually put to "full ahead," the engineer should give it to her as he would a laxative to his baby—in a gentle and persuasive manner.

What We Accomplished

On the tow just mentioned we never as much as broke a ropeyarn, although we scrambled through dirty weather from the S.W. and N.W. The distance under tow was something like 1,500 miles, and time, 11 days, making an average of 136 miles a day.

Both ships were 10 knot tramps. The vessel towing steered good, but the one astern yawed badly. Only on one day had we a real chance of seeing what could be done in fine weather, and it must surprise the reader to know that we actually made 7 miles an hour for about 20 hours. Towing propositions, therefore, are a little deceiving. The approximate length of our tow rope would be a thousand feet. A bight representing 300 feet never came out of the water, and that is the salvation of heavy towing, a weight in the middle to absorb shock and strain.

Bermuda is naturally a haven for lame ducks, and when the pilots see a salvage tow bearing down on the reefs, they don't forget to bring a stout tug out with them and bargain for a slice of the prize money. In our case, we had shortened in the tow rope to about 400 feet and the sheltered channels were as smooth as a billiard table, but the foxy pilot made excuses that our jury gear might break and a real tug had to be used to take our consort into the inner harbor. After taking on fuel we proceeded to Baltimore. The other ship was towed to New York with two ocean tugs, as the cargo was in great demand and repairs could be better handled at the port of destination. Towing under the present conditions makes anxious watches for the engineers as well as the deck crew, for every part of the main engines is under an unnatural strain. Thrust blocks carry more weight, rods and straps have to do extra duty, and the whole outfit hums in a different tune.

Now, I have described a tow under bad conditions, but cool heads, and results came out good, but I would like to rehearse another tow, which was dead easy, but failed at first, because we had a feather-brained skipper.

The Second Experience

This time the scene was laid on the placid waters of the Mediterranean, between Malta and Port Said. We were bound east to Penang, Singapore, and the Philippines, in a common garden tramp, S. S. "Kirkfield," whilst the lame duck was bound west from India, and belonged to the famous Clan Line (a turret ship).

Just as we were using our sextants at noon, a speck was noticed ahead, and as we covered the "ground" it was apparent that the stranger was not steering. The weather was ideal, as smooth as a curling pond, and every man seemed to think, "Here's some easy money."

The first mistake that was made was on the part of the Clan boat, for she sent a small boat with chief officer and purser on board to parley with our captain about the price. Such a procedure is tommy rot, as the marine courts will settle these things in spite of you, anyhow. Our skipper offered to tow to Port Said, the Suez Canal entrance, and leave the costs to arbitration. This was agreed to, and as the water was calm and likely to be, a wire hawser was soon passed between the two ships, but instead of doing as we did in the previous tow, the skipper would have the wire brought over the poop and taken to the mainmast and fastened—mark you—to a height on the mainmast which allowed the rope to be flush with the poop deck.

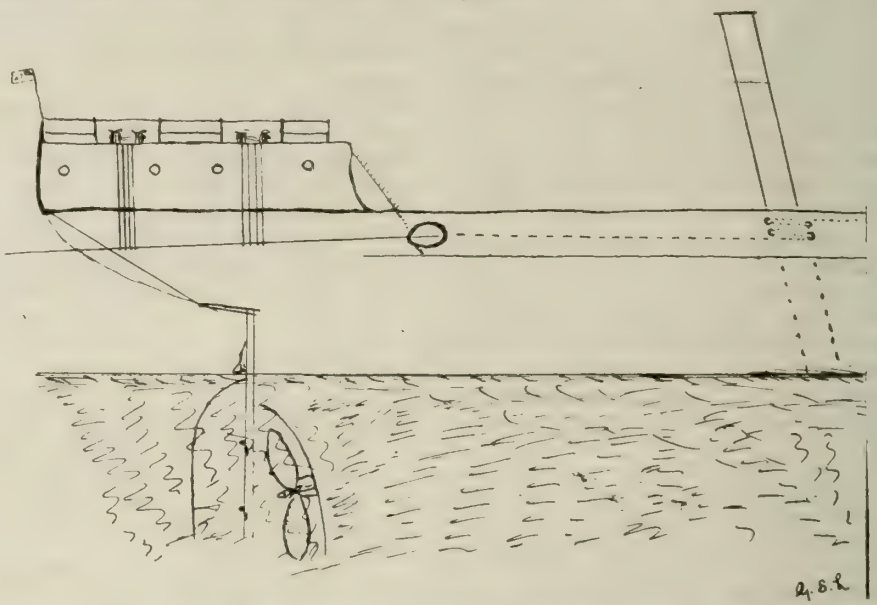
Now, you can use a sailing ship's masts in that way, but not a steamer's, as they are not sufficiently stayed and shrouded for stresses of that kind. Although we had gone to great pains to rig preventer stays to the mast as soon as the tow rop had a "dead slow" pull on it the mast threatened to fall around our ears.

After using up all the deep water nouns and qualifying them with nautical adjectives, the skipper ordered the hawser to be brought in through a quarter pipe, thence to the mast just above the canvas coat, and then to the corner bitts in the well.

A peculiar thing happened then, another Clan liner came along and wanted to do the towing for her own company's ship, but all that we allowed of that request was to slow down that a few passengers might transfer, and thus proceed on their journey east, instead of going to Port Said, where the vessel would have to lie for at least a month till new sections of shaft and other mechanical parts were brought out from the Clyde yards.

The tow in this case was over 700 miles, every inch of it in a dead calm, but we made a bad start. Now, I don't say that you can't tow from the poop, but I do say that the average ship's ballards or bitts on that deck are not to be trusted for sea towing, and that's why the only alternative seems to be in bringing the hawser through the well deck pipes.

In a hurricane-decked ship, where everything is flush, it would be quite easy to make a bee line from the taffrail to the mast. Another way, if the mast proposition was out of the question, would be to pass both eyes of a towing hawser out through different quarter pipes and bring both eyes together on the poop at the taffrail, shackle them together, and then connect from the two. This would really be making your tow rope fast to the afterpart of the vessel, and no mast or bitts would be at stake. Careful tricing from the poop, however, would be required to prevent the bridle getting under the quarter.



TOW LINE PASSING THROUGH QUARTER PIPE.

Now, if this article has even aroused a suspicion of interest in the problem under discussion, its mission is partly fulfilled. It is up to every young mate to study what he would do when his salvage tow comes along. He knows what gear he has on board, where the heavy iron snatch or shoe blocks could be fastened, which winch would give the best lead to prevent chafe, where the tricing lines would lie to safeguard the rudder and screws from the cumbersome towing gear, and so on. But some fellows may say, "I'll leave all this to the captain." That's just where you make the mistake, for thousands of hoary-headed shipmasters never had the luck to fall in with a salvage job, and frequently the skipper is as green at the new circumstances as the first voyage third or second mate, and if you show initiative at such hazardous work your future success is more of a certainty.

Pointers

When a vessel weighing thousands of tons wishes to entice another such weight to follow her on a string, no lashing can be too strong, no supervising head too cool. As regards the steering, don't do any hard-over manoeuvres, even altering the course must be done gently, as non-towing craft have the preventor gear to look after.

In taking in heavy steel wire rope with a traveler or whip to winch or capstan, you will find that small chain strops or snotters bite best and don't slip on the wire hawser, as manila strops are apt to do.

A real tug has heavy auxiliary machinery and Sampson posts on the after deck, but the ordinary cargo steamer has not, hence the confusion and awkwardness when towing has to be done, and crude methods of substitution have to be used.

Something to Avoid

Whether you are towing or being towed, abstain from exaggeration in log book entries. In the first case cited here we certainly came through dirty weather, and both vessels rolled and shipped considerable water, yet the vessel which was broken down had log entries that are common in the tropics, but seldom heard of in North Atlantic winters.

The idea was to make it appear that the risk run and services rendered were of an unimportant nature, but when a cold and calculating prize court sit down to award salvage monies, the two ships' log books had far better read nearly alike as to meteorological data or the mates who made the entries are in for a stiff examination.

Easing Down

When getting near your destination, or for other reasons, which may cause you to reduce speed, spread the reductions over a lengthy period, if possible. Thus you will be able to keep both ships in a straight line as long as steering is looked after.

Questions and Answers

Q.—What lights do you exhibit when being towed?

A.—The red and green side lights only.

Q.—What are the great assets in sea towing?

A.—Cool planning, heavy gear, and a submerged hawser.

Q.—What could be used to advantage in heavy weather towing?

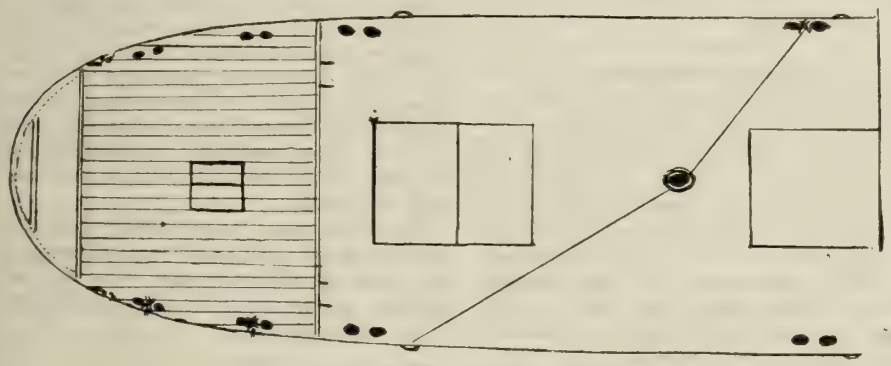
A.—The oil system for quietening the waves. The ship acting as tug would spread the oil.

Q.—Say that a powerful liner broke or lost her rudder and a tramp steamer hove in sight, what would likely be the procedure?

A.—The big fellow would tow the tramp. By this means the liner could be steered through the medium of the small ship swerving from one quarter to another—acting after the principle of a droque.

Q.—Say that you had two pairs of bitts or niggerheads in line on the poop and you must tow with them, how would you make fast?

A.—Take a round turn on the furthest aft horn; then pass one figure of eight in the usual manner; then commence in the same way on the next bitts, but fill up with figure of eights and stop back the end with a luff tackle to minimize any chance of a surge growing into a slip.



DECK VIEW OF TOW LINE.

Q.—What is the great danger if such towing posts break?

A.—In sweeping the poop they may foul your steering gear, then both ships will be in a helpless condition.

As per illustration, the deep-water towing hawser must be under water. An outfit that could become taut is worse than useless.

IS THE MASTER AN OWNER'S MAN

The masters and officers of our Merchant Marine understand that the vessels they are in charge of are, to a very great extent, bought and paid for by public money, and that they cannot sail them without crews. Naturally, they become the leaders of our seamen. Who else should the seamen look to for assistance and support? Every master and officer who has obtained a certificate from the Government in Ottawa was once a seaman. As the master is held responsible for the safety of the ship and cargo during the venture, is he not the representative of all parties concerned, and, without doubt, an owner's man?

By the above we see there can only be two interests in a vessel, the one interest sails her for a dividend, the other sails her for a living.

If unity means strength, then, should not these two interests be united into one to ensure the safety and prosperity of Canada's international trade and commerce under her own flag?

Would it be unjust for the officers and seamen of our merchant marine to ask for a somewhat fairer division of this vessel's profits, and if the master is an owner's man should he not divide the profits with the other owners? If they wish to fix what wages he should have, then would it be out of place for the masters of these vessels to appeal for a fairer distribution of power, so that they may be placed in their rightful position as active managing owner of the ships they command?

FOUR MILLION IN TONNAGE

What are our Canadian yards doing? Will America outbuild us and so control the mercantile marine fleet? It should make us sit up and take notice and consider our position. If the U. S. A. consider it worth while, why not Canada?

We are given to understand that steel ships built in American yards this year are expected to total at least four million tons. The output, according to shipping board officials, will exceed by seven hundred thousand tons the combined construction of both steel and wood bottoms last year.

The great production in steel tonnage this year will be the result of the tremendous preparations started under the impetus of war.

Thn, again, Australia is getting in line. We hear it said that Australia's new state merchant marine programme is for 24 vessels at a cost of $17,000,000. With the 13 vessels bought two or three years ago the Commonwealth will have about as large a state marine as Canada.

OTTAWA.—It is expected that the Government will decline to grant further licenses to American shipping engaged in the coasting trade in Canadian waters, except under very exceptional circumstances. Intimation that such a course is likely to be adopted was given in the House by Hon. A. K. MacLean, Acting Minister of Marine and Fisheries. Mr. McLean read, first, the following telegram received from Washington: "Advices from our representatives for the Lakes district indicate apparent scarcity business on the lakes for American ships for this season. Coastwise permits are now almost invariably declined on the Atlantic and Pacific coasts, only exceptional situation warranting a departure from this policy." Mr. McLean added: "Inasmuch as the United States declines to confer the privilege upon Canadian vessels engaged in their coasting trade, it is contemplated that no further licenses be granted to American ships for the coasting trade in Canadian waters except under very exceptional circumstances. This will place our policy in this regard on a parity with that of the United States."

Interesting Notes from Canada and Abroad

A TRIP ON THE STEAMER "LAKETON"

By SANDY McTAGGART

A trip from Port Colborne to Sault Ste. Marie on this fine modern vessel, owned by the Matthews Steamship Co., of Toronto, commanded by Capt. C. R. Albinson, Chief Engineer James Fisher.

This vessel was rebuilt in Collingwood and went into commission with the opening of navigation in the spring of 1918. Great credit is due the owners for the very elaborate accommodation provided for both officers and seamen of this vessel; also the substantial workmanship turned out by the Collingwood Steamship Company.

Where such care is shown by the owners for the comfort of those who man their ships, no seaman worthy of the name could do anything else but work with his whole power and might to make such vessels a financial success.

On entering the Detroit River, Capt. Albinson stopped at Mullen new coal dock to receive bunker coal. Mr. Mullen and his staff seem to be sparing no expense to make the new dock in every way very suitable to accommodate the largest vessels we have on our lakes, and on making enquiries from Mr. Fisher, we are informed that Mr. Mullen and his staff are at all times very attentive and accommodating to customers, giving everyone, so far as they know, a fair, square deal, and because of this business principle we wish Mr. Mullen every success in his new venture.

After leaving this dock and passing the City of Detroit, it was observed that no less than 26 new canal-sized vessels were lying on the American side of the river, ready to proceed to Tidewater, and a great number on building slips in different stages of construction. If this is an indication of the shipbuilding program throughout the United States, may we not ask the question: How long will it be before the Star Spangled Banner predominates in the world's trade?

What part is Canada going to play in this great commercial war? Will our people ever realize that building railways can never bring them the international power and prestige necessary to the existence of themselves and their children?

On proceeding up the St. Clair, Capt. Albinson pointed out the need there was for a set of ranges on the west side of Walpole Island to lead our vessels clear of the shoal at the head of Russel Island and the shoal water on the west side of Walpole. The land being so low it is very hard to judge the distance, and a set of ranges would increase the safety of navigation at this point.

This vessel passed through the Soo Lock without further incident.

During the whole trip from Port Colborne, we could neither see nor find ice enough to mix a whiskey and soda, a very rare occurrence for the first trip in the spring.

CANADIAN MERCHANT SERVICE GUILD APPROVED

A bill to grant incorporation of the Canadian Merchant Service Guild, the first institution of the kind to be incorporated in Canada, was passed this morning by the Commons Committee on Banking and Commerce.

At Ottawa it was explained that what was sought was a Dominion charter for an organization. The present organization, which had had no legal status, now has a membership of 500.

It was stated that the principle of the Guild was the same as that governing bodies of this kind, which have been in existence for many years in other parts of the Empire. It was a professional, rather than a labor organization. Provision is made in the bill for the organization of branches of the Guild in other parts of Canada.

"CANADIAN WARRIOR"

The S. S. "Canadian Warrior," built by the Collingwood Shipbuilding Co., left Collingwood April 30 in charge of Capt. J. N. Foote; Capt. C. Dennis, 1st mate; and Capt. R. Graham, 2nd mate, together with a crew of lake men, bound for Lake Erie to load coal for Montreal; then, it is understood, she will proceed to deep water, where she will be employed carrying on Canada's international trade and commerce.

She seems to be a very fine ship, having first-class model, fine workmanship and finish.

We congratulate our Government, to whom this vessel belongs, for the accommodation afforded both officers and crew, as decent accommodation on board our vessels will attract the right class of men to fill the ranks of our mercantile marine. Let us wish the "Canadian Warrior" great success and prosperity, as she and her flag traverse the world's commercial trade routes, demanding that recognition which is due Canada and her people.

CANADIAN PACIFIC LINES

Great Lakes Section

Their five staunch and strong vessels have been fitted out and prepared for the season of navigation, and from May 5th will ply between Port McNicoll and Fort William, calling at Sault Ste. Marie and Port Arthur, and, we understand, at least once a week to Owen Sound.

We wonder if the public know and appreciate how much time and money the officials of this line spend to ensure the safety of public life and property afloat, even to the extent of coaling their vessels, and sending them out for a cruise before they commence their season's work, to make doubly sure that the engines and navigating appliances on these vessels are in first-class shape.

Where such energy and care is used to safeguard the lives of our traveling public, let us hope it may be appreciated according to merit.

Our readers will be pleased to hear that Capt. Barrett, of Owen Sound, has been appointed sailing master on the Government survey vessel, "Bayfield," and will be employed during the summer months on our inland waters.

With Capt. Barrett's experience and training on our inland waters and the success which has followed him during the time he has been in command, he should be well fitted for such a position and let us wish him every success for the future.

VICTORIA HARBOR LUMBER CO.

We see that the company have their saw and planing mills at work and are fitting out their two fine tugs, Charlton and Reginal, to tow logs from the north shore of Georgian Bay. These two tugs are fitted with very powerful wireless apparatus, which will be very useful in keeping the owners informed where they are, and more especially if they are on the Bay, in bad weather, with a raft and need assistance.

This is a very large lumber concern, situated at Victoria Harbor on Georgian Bay, and the officials seem very courteous and altogether a fine stamp of men to do business with.

OUR SEAMEN AND THEIR FRANCHISE

By SANDY McTAGGART

We notice that at the time of our last Dominion election, when a great many of our younger men were over in France and Flanders fighting for right and liberty, the Government went to work and put machinery in motion to allow these men the use of their franchise.

We congratulate our Government for taking that action, but what about our seamen who are fighting day after day, year after year, during their whole lives, to build up our international trade and commerce, so as to maintain the power and prestige necessary to enable Canada and her people to have something to say in the affairs of the outside world?

Greeks, Italians, Doukhobors, and all other nationalities come into Canada and as soon as they arrive we set to work to have them naturalized at the very earliest moment possible, so that they may be able to use, or should we say, abuse their franchise. Ask the secret service of any country and they will tell you that 75 per cent. of all foreigners living amongst them are spies. Look and see if 90 per cent. of the labor disturbers, agitators and malcontents living amongst us are not foreigners or of foreign extraction, with no

other aim in view, than if possible to disorganize our institutions and increase the cost of production to an extent that it will eventually undermine the international trade and commerce of the country they are for the time being living in. This is but natural, as these people are simply giving a part of their lives to the best interests of their several fatherlands, for which they must be commended, and it rests with the people of Canada to circumvent their endeavor. Why should we say to these people, "Come along, your influence and support is necessary to the building up of a greater Canada, and to our seamen, who are doing their very best to uphold the honor of Canada and her flag throughout the world's commercial trade routes, we say, "If you wish to use your franchise, you must stay at home?"

Is this justice to these men, who realize that when they leave port, they must become the representatives of those who own our vessels? For this reason they are determined never to allow themselves or their profession to get mixed up with labor institutions of any kind whatever, as they are to a very great extent, made up, more or less of the classes we have already mentioned, and amalgamation with such could only spell disaster to the international trade and commerce of Canada and her people.

Do men with such determination and British blood in their veins not deserve better treatment from their Government?

May we say the time is at hand when those who man our merchant ships shall be provided with a means of giving their support and influence toward the future destiny of Canada and her people, or shall they remain as in the past, ignored by their Government with regard to their just rights, as citizens, in this respect?

Perhaps this may give our readers an insight into the treatment their seamen receive from those who have the power to deal with such matters.

ADMIRAL BEATTY

We all honor Sailor Admiral Beatty and note that France is in line when presenting him with the Grand Cross of the Legion of Honor, he being the winner of heroic combat at Jutland. Admiral Beatty was presented with the Cross by President Poincare at the Palace of Elysee. The Admiral was accompanied by Lady Beatty and a number of British naval officers. President Poincare in his address said:

"I am happy to have this occasion of expressing the congratulations of the French Republic to you all. Gentlemen, let me ask you to convey them to the staffs and crews of the British Navy, who made such a glorious contribution to victory.

"I particularly wish to offer my warmest congratulations to Sir David Beatty, who had the command of the battle cruisers and of all the forces engaged in the splendid actions off Heligoland and the Dogger Banks, and who the heroic combat of Jutland. In making you, Sir, a Grand Cross of the Legion of Honor, France is doing honor to all who have served under you."

BRITISH NAVY

When we read of the 2,000,000 tons added to the navy, what about a Canadian navy? Twelve new types of submarines were added to the British navy, the three famous "hush" ships were built, three hundred destroyers, and 100 mine sweepers.

IONA SINKS

The fishing tug "Iona," owned by White & Co., of Toronto, sunk in the harbor at Meaford, where it was tied up for the winter. It is not known for a certainty what caused the tug to sink, but it is believed to have resulted from the oakum loosening and falling out with the dropping of the ice from the hull during the mild weather. The "Iona" was built nine or ten years ago for Mr. Hector McInnis and was used by him as a fishing tug until the time of her sale to the Toronto Company. The boat will be raised.

GEORGIAN BAY SHIPBUILDING AND WRECKING COMPANY

The company's plant is situated at Midland, Ont., and last month launched and turned out from their yards, the "Bell," owned by Captain Kennedy, of Meaford. It was launched after being thoroughly overhauled.

The tug "Helen S.," owned by Manley Chew, was launched, and the tug "Midland" was turned out from the yards already for another season, as well as "Harry A." belonging to Lieut.-Col. Syes.

We understand the yards are now fitting up the Government steamer Lambton.

C. M. S. G. MEMBERSHIP

The membership of the organization is larger than any other organization amongst our mercantile marine. The secretary reports that during the month of April quite a few joined from master to watchman; he feels that each month the membership will greatly increase, and the C.M.S.G. "Review" has brought the organization before many of the "Review" readers.

Moral:—Read and subscribe to the publication and know the work being done, and the educational items of the "Review" are of true interest to all sailors.

The tug "Jack" was launched at Owen Sound on April 5th. The little vessel is owned by the Keenan Company and was rebuilt during the past winter.

OBITUARY

Capt. J. P. Delaney

We are sorry to report the death of Capt. J. P. Delaney, the well-known mariner of the Great Lakes, who died at St. Catharines. During his life on the Lakes, from call-boy to commander, he had some of the finest steamships under his command, and then assumed the important duties of a St. Lawrence river pilot. For years he was a master mariner in the employ of the Matthews Transportation Co. He appeared to be a born navigator. Through his long service as master he never lost a vessel, in fact, it may be said he never had a serious mishap. He was born in Prescott 59 years ago, and has resided in St. Catharines for upwards of 25 years.

CAPT. CAMPBELL

We are sorry to report the death of Capt. Andrew L. Campbell, of Str. Noronic. Although it was known he was ill, the news of his death came with startling suddenness to the people of Collingwood. He died at the home of his brother-in-law, Mr. C. S. Proctor, 26 Spencer Ave., Toronto.

Captain Campbell was one of the younger lake mariners. He was born in Collingwood forty-four years ago and was the elder son of Capt. P. M. and Mrs. Campbell. After following the town schools he followed in the footsteps of his father and entered upon the life of a mariner. After a few years on steamers of the G. N. Transit Co. he went across the line and sailed on ships of the Cleveland Cliff Co., among others the "Cadillac." Upon returning to Canada he became associated with steamers of the Northern Navigation Co., with which he made steady advancement. For a season or two he sailed the "Huronic," on which he was on the bridge last season. This season he was appointed to succeed Capt. R. D. Foote, superannuated, on the flagship of the fleet,

The illness which terminated in death commenced about a year ago, but the hope was that care and rest would bring him back to his old-time health.

The remains were brought to Collingwood, and on arrival taken to the Presbyterian Church. After the service interment took place in the Presbyterian cemetery.

CAPT. S. CRANGEL

Capt. S. Crangel, shipbuilder and master, of Toronto, died at his winter home in Los Angeles following a brief illness. His wife was with him. Deceased was about 80 years of age, and was one of the oldest mariners on the Great Lakes. He was superintendent of the St. Lawrence and Chicago Steam Navigation Company and spent thirty years of his life building steel freighters, comprising among others the "Rosedale," "G. R. Crow," "W. D. Matthews," "James Carruthers," and "J. H. G. Hagarty." The body was brought to Toronto for burial.

Work in Progress in Canadian Shipyards

A Record of Work Recently Completed or in Process of Completion — Principal Features of Specification—Approximate Launching Dates—Vessels on Order

BRITISH COLUMBIA

YARROWS, LIMITED, ESQUIMALT, B.C.
Occupied on marine repairs and marine castings.

H. VOLLMERS, NANAIMO, B.C.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
Building five wooden steamers for French Government. Three of 3,500 tons for Belgian interests.

B.C. CONSTRUCTION & ENG. CO., POPLAR ISLAND, NEW WESTMINSTER, B.C.
Four wooden vessels, 1,800 gr. tons, 2,800 tons d.w.

NEW WESTMINSTER MARINE CO., FT. OF FURNESS ST., NEW WESTMINSTER, B.C.

STAR SHIPYARD CO., NEW WESTMINSTER, B.C.

J. A. CROLL, PORT ALBERNI, B.C.

PACIFIC CONSTRUCTION COMPANY, COQUITLAM, B.C.
"Eirini," 2,800 tons d. w., for Greek interests, completed April, 1919.

C. E. BAINTER, PRINCE RUPERT, B.C.
Several wooden fishing steamers, for undisclosed interests.

S. A. MOULTON, PRINCE RUPERT, B.C.

BRITISH-AMERICAN SHIPBUILDING & ENG. CO., VANCOUVER, B.C.

JOHN COUGHLAN & SONS, N. VANCOUVER, B.C.
Building four 8,100 ton steamers for Canadian Government. Four 8,800 ton steamers same as "Alaska."

THE FOUNDATION CO., VANCOUVER, B.C.

FRASER VALLEY SHIPBUILDING CO., VANCOUVER, B.C.

GRANT, SMITH & CO., VANCOUVER, B.C.

HARRISON & LAMOND, SHIPBUILDERS, LTD., VANCOUVER, B.C.

LYALL SHIPBUILDING COMPANY, N. VANCOUVER, B.C.
Building eight wooden steamers of 1,500 tons capacity for French Government.

W. R. MANCHION, VANCOUVER, B.C.

STANDARD SHIPBUILDING CO., VANCOUVER, B.C.
Three vessels, "Donohue" composite type, 3,500 deadweight. Standard engines, 1,200 I.P.H. Keel laid June 1st. To be launched December and completed January, 1920.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
Number of small vessels being constructed at total value of $300,000. 4,500-ton floating drydock, 352 ft. long.

VANCOUVER SHIPYARD, LTD., VANCOUVER, B.C.

THE WALLACE SHIPYARDS, LIMITED, NORTH VANCOUVER, B.C.
Building four steamers for Dominion Government; two of 4,300 tons deadweight and two of 5,100 tons deadweight.

CHOLBERG SHIPYARD, VICTORIA, B.C.
4 1,500-ton vessels for Norwegian purchasers. Keels laid Oct. 4th, 10th and 26th respectively.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
"Teco," 300 tons. Motor coasting freighter fitted with Bolinder 200 h.p. Built for William Mason Rooke.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.

NORTHERN CONSTRUCTION CO., VANCOUVER, B.C.
6 1,500-ton d.w. compound engines, 12 x 24 x 16 stroke, twin screw water tube boilers, 2,000 sq. feet heating surface. Building for French Government.

PRINCE RUPERT SHIPBUILDING AND ENGINEERING CO., PRINCE RUPERT, B.C.
Two 8,100 tons deadweight steamers for Canadian Government.

WESTERN CANADA SHIPYARDS ,LTD., VANCOUVER, B.C.
"War Nootka," Jan. 4, 1918, 3,080 tons (machinery installed at Ogden Point Assembly Sheds).
Six wooden freight steamers, 250 ft. h.p., 259 ft. o. a., 43½ ft. extreme breadth, molded 42½ ft., 25 ft. molded depth., draft 22 ft., 2,800 tons d. w., for undisclosed interests. "War Nootka," launched January 4, 1918. "War Selkirk" launched March 6, 1918.
"War Tatla," "War Casco, "War Chilkat," "War Tanoo," 4 standard vessels now under construction.

CAMERON-GENOA MILLS CO., VANCOUVER, B.C.

THE FOUNDATION COMPANY, VICTORIA, B.C.
Building twenty wooden steamers of 3,000 tons deadweight for French Government.

CLARENCE HOARD, VICTORIA, B.C.
Wooden car barge for C.P.R., Jan., 1918.

VICTORIA SHIPBUILDING CO., VICTORIA, B.C.
Constructing wooden ships for British Govt., 3,500 tons each.

VICTORIA MACHINERY DEPOT, VICTORIA, B.C.
Two 8,100 tons deadweight steamers for Canadian Government.

NEW BRUNSWICK

C. T. WHITE & SON, LTD., ALMA, N.B. (Office at Sussex, N.B., also.)

JAMES X. LENTEIGNE, LOWER CARAQUET, N.B.

INTERNATIONAL SHIPBUILDING CO., NEWCASTLE, N.B.

EUREKA SHIPBUILDING CO., NORTH HEAD, N.B.

PORT COLBORNE BUILDING & REALTY CO., LTD., REXTON, N.B. (Head Office, Welland, Ont.)

GRANT & HORNE, ST. JOHN, N.B.
Two wooden cargo steamers, "War Fundy" (launched Aug., 1918) and "War Moncton," 250 ft. x 42 ft. 5 in. x 25 ft. 5 in., 1,000 h.p., speed 9½ knots, 2,800 tons d.w., for undisclosed interests.

MARINE CONSTRUCTION CO., CANADA, LTD., ST. JOHN, N.B.

ST. JOHN SHIPBUILDING CO., ST. JOHN, N.B. (Plant at Courtenay Bay.)

ST. MARTIN'S SHIPBUILDING CO., ST. MARTIN'S, N.B.

PETER & A. A. McINTYRE, ST. JOHN, N.B.
One 900-ton schooner under construction.

NEWFOUNDLAND

ANGLO-NEWFOUNDLAND DEVELOPMENT CO., BOTWOOD, NFLD.
Two three-mast aux. schrs., wood, 450 tons, 150 H.P. for the builders' account.

NEWFOUNDLAND SHIPBUILDING CO., HARBOR GRACE, NFLD.
To build ships of 1,200 tons d.w. Steel ships later.

M. E. MARTIN, MORRIS ARM, NR. ST. JOHN'S, NFLD.

UNION SHIPBUILDING CO., ST. JOHN, NFLD.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL, N.S.

NOVA SCOTIA

B. L. TUCKER, BASS RIVER, N.S.

JAS. S. CREELMAN, BASS RIVER, N.S.

HANKINSON SHIPBUILDING CO., BELLIVEAU'S COVE, N.S.
One schooner, 360 tons, wood.

ELI PUBLICOVER, BLANDFORD, N.S.

BRIDGEWATER SHIPPING Co., BRIDGEWATER, N.S.

W. A. NAUGLER, BRIDGEWATER, N.S.

H. MAC ALONEY, CANNING, N.S.

S. M. FIELDS, CAPE D'OR, N.S.
One three-masted schooner, 350 tons.
Keel laid for another three-master.

CHESTER BASIN SHIPBUILDERS, LTD., CHESTER BASIN, N.S.
Two schooners, 100 tons, wood. Launched Aug., 1917, Dec., 1917
One four-masted schooner, 60 tons. Launched Sept., 1918.
One two-masted schooner, 100 tons. Launched June, 1918.

MORTIMER PARSONS, CHEVERIE, N.S.
One wooden three-masted schooner, 170 ft. x 38 ft. x 14 ft., 575 gr. tons, 900 tons cap., for builder's account. Launched Sept., 1918.
Two wooden three-masted schooners for builder's account.
One tern schooner, "Donald Parsons," 140 ft. keel x 34 ft. 4 in. x 12 ft. 4 in., 500 gross tons, 825 tons d.w. for Mortimer Parsons. Launched May 11, 1918.
Another vessel, same size. Launched Nov., 1918, for builder's account.

BAY SHORE SHIPYARD, CHURCH POINT, N.S.
Building two wooden vessels for R. C. Elkin, Ltd., St. John, N.B.

MOISE BELLIVEAU, CHURCH POINT, N.S.
One schooner, 450 tons, wood.

FIDELE BOUDREAU, CHURCH POINT, N.S.
One schooner, 350 tons, wood.

J. E. GASKILL, CHURCH POINT, N.S.
Other yards at Grosses Coques, Little Brook, Meteghan and Port Wade, N.S.
Five wooden schooners from 344 to 387 reg. tons. All sister ships.

COMEAU SHIPBUILDING CO., COMEAUVILLE, N.S.
One three-masted wooden schooner, for builder's account, 450 tons.

J. W. COMEAU, COMEAUVILLE, N.S.
One schooner, 329 tons, Jan., 1918.

J. N. RAFUSE & SONS, CONQUERALL BANKS, DIGBY CO., N.S.
(Other plants at Salmon River and Shelburne, N.S.)

E. F. WILLIAMS, DARMOUTH, N.S.

ROBAR BROTHERS, DAYSPRING, N.S.
Schooner for Capt. Ivan Creaser, Dayspring.

MAURICE E. LEARY, DAYSPRING, N.S.
One wooden schooner, 225 tons, 135 ft. o. a. Launched Aug., 1918, for La Have Outfitting Co., La Have, N.S.

J. NEWTON PUGSLEY & CHAS. ROBERTSON, DILIGENT RIVER, N.S.
One schooner, three-masted, 475 tons.

McLEAN & McKAY, ECONOMY, N.S.

S. J. SOLEY, ROX RIVER, N.S.
One schooner, three-masted, 121 ft. keel, 300 tons. Built of native wood. Launched Sept., 1918. For builder's account. For sale.

ALLAN & FRASER, FRASERVILLE, N.S.
One schooner, 350 tons, wood.

BERNARD W. MELANSON, GILBERT'S COVE, N.S.
One three-masted schooner, wood, 250 tons net. Completed November, 1918, for builder's account.

AMOS BLINN, GROSSES COQUES, N.S.
One schooner, 375 tons. Jan., 1918.
One schooner, 350 tons, wood.

BINN BROS., GROSSES COQUES, N.S.

F. K. WARREN & CO., GROSSES COQUES, N.S. (Offices in Union Bank Chambers, Halifax, N.S., also.)
350-ton tern schooner, under construction Jan., 1918.

HALIFAX SHIPBUILDING COMPANY, HALIFAX, N.S.
Building four steamers for Canadian Government. Two of 8,100 tons and two of 10,000 tons. One keel laid January. Also operating dry dock and repair works.

J. WILLARD SMITH, HILLSBURN, N.S. (Head Office, St. John, N.B.)
One tern schooner, wood, 140 ft. keel, 35 ft. beam, 450 tons net reg. tons.

J. W. RAYMOND, LITTLE BROOK, N.S.
Building 500-ton wooden schooners for local owners.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S.
One 800-ton vessel for undisclosed interests. Launch about Dec. 24.

CONRAD & REINHARDT, LUNENBURG, N.S.
"Excellent," 600-ton, launch in January next. Also 175-ton schooner.

J. WILLARD SMITH, HILLSBURN, N.S.
Wooden three-masted schooner. Launch in April, 1919.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
750-ton auxiliary schooner. Completed in January, 1919.

OSMOND O'BRIEN & CO., NOEL, N.S.
"J. Miller," 700 tons. Keel laid April 18. Launched Nov. 20. Completed Nov. 27.

BERNARD & MELANSON, GILBERT'S COVE, N.S.
550-ton vessel for owner's account. Completed Nov. 25.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL
"Mapleland," 1000-ton schooner, fitted with twin Fairbanks-Morse oil engines, 200 horsepower. Complete about Dec. 10. For builder's account.

L. S. CANNING, WARD'S BROOK, N.S.
"W. C. Smith," 700 tons. Completed Dec. 18.

McLEAN & McKAY, ECONOMY, N.S.
"Truro Queen," 750 tons, 15 h.p. engine for hoisting sails and anchor. Completed.

HENRY COVEY, INDIAN HARBOR, N.S.

CHARLES GRIFFIN, ISAACS HARBOR, N.S.
One schooner, 40 tons, wood.

LEWIS SHIPBUILDING CO., LEWISTON, N.S.
One schooner, 670 tons. Jan., 1918.

INNOCENT COMEAU, LITTLE BROOK, N.S.
One three-masted schoner, 140 ft. x 35 ft. 6 in. x 17 ft. 6 in., 650 gr. tons, for the Weymouth Shipping Co., Weymouth, N.S., Can. Delivered Jan. 18, 1918.

J. W. RAYMOND, LITTLE BROOK, N.S.
One wooden schooner, No. 4, 140 ft. x 36 ft. x 17 ft., 575 gr. tons, for Jones Bros., Weymouth, Digby Co., N.S.

H. A. FRANK, LIVERPOOL, N.S.
Two wooden schooners, 500 tons, for builder's account.

McKEAN SHIPBUILDING CO., LIVERPOOL, N.S.

W. F. McKEAN & CO., LIVERPOOL, N.S.
One schooner 400 tons, Jan., 1918.

D. C. MULHALL, LIVERPOOL, N.S.
Two wooden schooners, one 300 gross tons, other 400 gross tons, for undisclosed interests.

ROBIN, JONES & WHITMAN, LIVERPOOL, N.S.
One schooner, 340 tons, wood.

SOUTHERN SALVAGE CO., LIVERPOOL, N.S.

CONRAD & REINHARDT, LUNENBURG, N.S.

LUNENBURG MARINE RAILWAY, LUNENBURG, N.S.

FRED A. ROBAR, LUNENBURG, N.S.

J. B. YOUNG, LUNENBURG, N.S.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.

J. ERNEST & SON, MAHONE BAY, N.S.
One schooner, 520 tons. Jan., 1918.

O. A. HAM, MAHONE BAY, N.S.
One schooner, "Dozle," 128 tons. Launching May 30. One motor boat about 20 tons.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S. (Leased to Montague Mahaffy, Toronto.)
One three-masted schooner, 325 tons gr. reg., 500 tons cap., West Indies freight type. Launched July.
Keel laid for another three-masted schooner with cargo capacity of 425 tons.

JOHN McLEAN & SONS, MAHONE BAY, N.S.
One schooner, 95 tons, wood.

J. A. BALSOM CO., LTD., MARGARETSVILLE, N.S.
One schooner, 409 tons. Jan., 1918.

CLARE SHIPBUILDING CO., METEGHAN RIVER, N.S.
One wooden schooner for builder's account. 400 tons.

A. H. COMEAU & CO., METEGHAN, N.S.
One schooner, 400 tons, wood.

AGAPIT COMEAU, METEGHAN, N.S.

JOHN F. DEVEAU, METEGHAN, N.S.
A 300-ton schooner was launched recently for Ritcey & Co., Lunenburg, N.S., and named Charles A. Ritcey.
1 schooner, 425 tons. Jan., 1918.
1 schooner, 400 tons, wood.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
One wooden sailing schooner, 800 tons d.w. Keel laid April 15th, 1918, to be launched December 17th and completed December 31st. Built for sale.

J. E. GASKILL, CHURCH POINT, N.S.
One wooden schooner, 750 tons d.w. Keel laid March, 1918, to be launched December 15th. Built for J. E. Corkill.

THERIAULT SHIPBUILDING CO.
One wooden vessel, 500 tons d.w. Keel laid September 18th, to be launched in May, 1919. Built for owners account.

SIDNEY ST. C. JONES, WEYMOUTH, N.S.
One tern schooner, "Westway," 450 tons d.w. Keel laid April 18, to be launcheed December 30, 1918, and completed in January, 1919. Built for sale. 130 feet by 28 feet 8 inches beam by 10 feet 6 inches deep.

THE HANKINSON SHIPPING CO., BELLEVEAU'S COVE, N.S.
One vessel, 750 tons d.w. "Charles Doucet," fitted for auxiliary engine. Keel laid April 1, to be launched December 17. One vessel 750 tons d.w. Keel laid Aug., 1918, to be launched April, 1919, and completed. Built for owners account.

FAUQUIER & PORTER, HANTSPORT, N.S.
One vessel 1,800 tons d.w. to be fiitted with two 100 h.p. crude oil engines (Canadian Fairbanks-Morse). Launched December, 1918, and completed January, 1919. Built for sale. Propose to lay keels for two 500-ton, 3-mast schooners as soon as this schooner is launched.

N.S. SHIPBUILDING & TRANSPORTATION CO., LIVERPOOL, N.S.
"Protea," 400 tons d.w., three-masted schooner with provision for Morse semi-Diesel engines. Keel laid Nov. 18. To be completed May account and sold to Pearson & Walker, Cape Town, S.A.
"Gordon T. Tibbs," 400 tons d.w., three-masted schooner. Keel laid Aug. 30. To be launched Dec. 15 and completed Jan. 19. Built for buildeer's account and sold to G. Tibbs & Sons, St. John's, Nfld.
One beam trawler, 900 tons d.w., 400 i.h.p., with two 200 Fairbanks-Morse semi-Diesel engines. Keel laid Nov. 19. To be completed May next. Built for Rafuse Grey et al Le Havre. Repairing schooner Karmoe for N.Y. owners.

H. ELDERKIN & CO., PORT GREVILLE, N.S.
Two vessels, 825 and 500 tons respectively. Keel laid April and August. To be launched December and January. Built for builder's account.

J. E. GASKILL, METEGHAN, N.S.

THOMAS GERMAN, METEGHAN, N.S.
One schooner, 350 tons, wood.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S. (Leased James Cosman's shipyards.)
Building several wooden schooners for own account.

DR. F. H. MACDONALD, METEGHAN, N.S.

METEGHAN RAILWAY & SHIPBUILDING CO., METEGHAN, N.S.
One wooden three-masted schooner, 182 ft. x 35 ft., 450 gr. tons.
One schooner, 470 tons, wood.

CHAS. McNEIL, NEW GLASGOW, N.S.
One wooden 3-masted schooner, 103 ft. x 30 ft. x 10 ft. 9 in., 200 tons, for builder's account. Launched July, 1918.
One wooden 3-masted schooner, 142 ft. x 25 ft. 4 in. x 13 ft., 500 gr. tons, for builder's account. Launched Oct., 1918.

THE NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.
Building two 2,800 ton steamers for Dominion Government.

O'BRIEN BROS., NOEL, N.S.
One schooner, 325 tons, wood.

W. R. HUNTLEY & SON, PARRSBORO, N.S.
One wooden schooner, 175 ft. x 39 ft. x 17 ft., 900 gross tons, for

C. T. WHITE & SON, SUSSEX, N.S.

WAGSTAFF & HATFIELD, PARRSBORO, N.S.
One schooner, 400 tons. Jan., 1918.

S. SALTER, PARRSBORO, N.S.

DOWLING & STODDART, PORT CLYDE, N.S.

SWIME BROS., PORT CLYDE, N.S.
Several small motor trawlers, for builder's account.

G. M. COCHRANE, PORT GREVILLE, N.S.

ELLIOTT GRAHAM, PORT GREVILLE, N.S.
One schooner, 360 tons. Jan., 1918.

SMITH CANNING CO., PORT GREVILLE, N.S.
One schooner, 350 tons, wood.

WAGSTAFF & HATFIELD, PORT GREVILLE, N.S.
One schooner, 400 tons, wood.

WILLIAM CROWELL, PORT LATOUR, N.S.

J. W. RAYMOND, PORT MAITLAND, N.S.
One schooner, 375 tons. Jan., 1918.

PORT WADE SHIPBUILDING CO., PORT WADE, N.S. (Head Office, Digby.)
One 350-ton schooner, wood.

JOHN BROWN, PUBLIC LANDING, N.S.
One tow barge, 50 tons, wood.

THE CUMBERLAND SHIPBUILDING CO., PUGWASH, N.S.
Establishing plant for the construction of wooden ships.

MACKENZIE SHIPPING CO., RIVER JOHN, N.S.
One four-masted schooner, 600 tons, wood. About half built. Fitted for aux. engines.

CHARLES McLELLAN, RIVER JOHN, N.S.
One schooner, 100 tons, wood.

W. J. FOLEY, SALMON RIVER, N.S.
Building for J. N. Rafuse & Sons one wooden, 300 tons, under construction. Cap. of plant, 1,000 tons yearly.

J. N. RAFUSE & SONS, SALMON RIVER, N.S. (Other plants at Shelburne and Conquerall Banks.)
Launched recently a three-masted schooner named "Industrial," at W. J. Foley's ship yard at Salmon River, N.S., of the following dimensions: length, 113 ft, breadth, 30 ft., depth, 11½ ft., 325 tons.

ACADIAN SHIPPING CO., SAULNIERVILLE, N.S.
One schooner, 00 tons, wood.

SAULNIERVILLE SHIPBUILDING CO., LTD., SAULNIERVILLE, N.S.

J. LEWIS & SONS, SHEET HARBOR, N.S.
One schooner, wood, four-masted, 725 gr. tons. To be completed Sept.. 1918. For private account.

GEO. A. COX, SHELBURNE, N.S.
One schooner, 200 tons, wood.
One schooner, 322 tons, wood.

JOSEPH McGILL SHIPBUILDING & TRANSPORTATION CO., SHELBURNE, N.S.
"Sparkling Glance," 246 tons register, for Harvey & Co., St. John's, Nfld.
One schooner, 160 tons, wood.

W. C. McKAY & SON, SHELBURNE, N.S.
One wooden schooner, 130 ft. o. a. x 26½ ft. x 11 ft. depth of hold, 140 tons register. Launched Dec. 1, 1917.
One three-masted schooner, for Messrs. Hallet, of Newfoundland.
One schooner, 620 tons, wood.

BIGELOW BROS., CANNING, N.S.
Building 400-ton tern schooner, to be launched in May, 1919.

CONRAD & REINHARDT.
"Con-Rein," 600-ton schooner for own account. To be completed May, 1919.

O. A. HAM, MAHONE BAY, N.S.
Wooden steamer, 500 tons, triple engines. Built for M. A. Young & Co., Sydney. To be completed about July 15th.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S.
200-ton schooner. Keel laid April 28th. For sale.

SIDNEY ST. C. JONES, ESQ., PLYMPTON AND WEYMOUTH, N.S.
Not building at present.

NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

W. J. FOLEY, SALMON RIVER, N.S.
Building 650-ton schooner for J. A. Rafuse & Sons, about Sept. 15.

SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.
"Helen Mathers," 775 tons d. w. Built for A. Moulton & Sons, Halifax, N.S. Now building topsail schooner 550 tons d. w. for French interests with auxiliary oil engines.

T. K. BENTLEY, WEST ADVOCATE, N.S.
Building 1,000-ton sailing schooner, 3 masts, auxiliary engine for hoisting, to be completed in September.

J. N. RAFUSE & SONS, SHELBURNE, N.S. (Other plants at Salmon River and Conquerall Banks.)

THE SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.
One tern schooner, "Misty Star," 145 ft. x 31 ft. x 11 ft. 6 in., 600 tons d.w., 330 tons gross, for Harvey & Co., St. John's, Newfoundland. Launching Mar. 15, 1918.
One tern schooner, 154 ft. x 32 ft. x 12 ft. 4 in., 400 gr. tons, 700 tons d.w. cap. Launching June, 1918. Not sold yet.
Two schooners, one 349 tons, other 400 tons.

EASTERN SHIPBUILDING CO., SHIP HARBOR, N.S.
One wooden schooner, 600 tons d.w., for J. N. Rafuse & Sons., Halifax, N.S., Can.
One wooden schooner, 300 tons.

STEPHEN MORASH & CO., SHIP HARBOR, N.S.
One wooden schooner, 150 ft. x 37 ft. x 13 ft., four masts, for Canadian interests. Keel laid Feb. 5, 1917.

JAMES E. PETTIS, SPENCER'S ISLAND, N.S.
One schooner, 425 tons, wood, three-masted.

CAPE BRETON SHIPBUILDING CO., SYDNEY, N.S.

THE TUSKET SHIPBUILDING CO., TUSKET, N.S.

AMOS H. STEVENS, TANCOOK, N.S.

ALVIN STEVENS, TANCOOK, N.S.

STANLEY MASON, TANCOOK, N.S.

ALBERT PARSONS, WALTON, N.S.
One schooner, 400 tons. Jan., 1918.

H. T. LeBLANC, WEDGEPORT, N.S.
One steam trawler, 165 ft., 600 tons, for J. N. Rafuse & Sons.

L. S. CANNING, WARDS BROOK, N.S.
One tern schooner, 350 tons, for W. C. Smith & Co., Lunenburg, N.S

WEDGEPORT NAVIGATION & TRANSPORTATION CO., WEDGEPORT, N.S.

T. K. BENTLEY, WEST ADVOCATE, N.S.
One 200-ton steamer.
One 4-masted schooner, wood, 511 tons. To be launched September or October. For owner's account.

J. W. KIRKPATRICK, WEST ADVOCATE, N.S.
One 350-ton schooner, wood.

BOEHNER BROS., WEST LA HAVE, N.S.
Two large fishing schooners, 150 tons each.
One beam trawler, 300 tons, crude oil engines. For local interests.

BEAZLEY BROS., WEYMOUTH, N.S. (Head Office Roy Bldg., Halifax.)
One schooner, 394 tons, three masts.

E. R. GAUDET, WEYMOUTH, N.S.
One 350-ton schooner, three-masted.

E. P. RICE, WEYMOUTH, N.S.
One three-masted schooner, 350 tons.

RICE, WARREN & CO., WEYMOUTH, N.S.
One three-masted schooner, 334 tons.

FALMOUTH SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.
One wooden schooner, 350 gr. tons, 700 tons cap., for undisclosed interests.

NOEL SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.
One wooden schooner, three masts, 138 ft. x 35 ft. x 13 ft., 450 net reg. tons. Oil auxiliary engines. Launching August, 1918, for builder's account.

C. A. NICKERSON, WOODS HARBOR, N.S.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
Taken over and enlarging old plant of James Jenkins.
350-ton schooner building.

W. O. SWEENY, YARMOUTH, N.S.
100-ton fishing schooner.

YARMOUTH SHIPBUILDING CO., YARMOUTH, N.S.
One 450-ton wooden schooner, 128 ft. keel. To be completed Oct., 1918.

ONTARIO

CANADIAN ALLIS-CHALMERS LTD., BRIDGEBURG.
Four 3,500-ton steamers for I.M.B.; one launched, one ready to launch.

COLLINGWOOD SHIPBUILDING COMPANY, COLLINGWOOD, ONT.
"Canadian Recruit," launched May. Two steel steamers on berths.
"Canadian Warrior" completed. Three steel steamers on berths.

R. MORRILL, COLLINGWOOD, ONT.
"Windsor," Aug. 10, steam tug, 105 ft., for Ontario Gravel & Freighting Co.

CANADIAN CAR & FOUNDRY CO., FORT WILLIAM.
No present contracts.

DOMINION SHIPBUILDING COMPANY, TORONTO, ONT.
Building six canal sized steamers for own account. Three launched, remainder to be launched May, June, July. All to be completed this season.

GREAT LAKES DREDGING CO., FORT WILLIAM.
No present contracts.

THUNDER BAY CONTRACTING CO., FORT WILLIAM, ONT.
One wooden freight steamer, 261 ft. long, for undisclosed interests.

NATIONAL SHIPBUILDING COMPANY, GODERICH.
Building marine engines and boilers.

COLLINGWOOD SHIPBUILDING COMPANY, KINGSTON, ONT.
Building 3,500 ton steamer for Canadian Government.

DAVIS DRY DOCK CO., KINGSTON, ONT.
Building steel lifeboats.

GEORGIAN BAY SHIPBUILDING & WRECKING CO., MIDLAND.
Repairing several wooden tugs.

MIDLAND SHIPBUILDING COMPANY, MIDLAND.
"War Magic," second steamer for I. M. B., launched in May.
Two steel steamers for Imperial Munitions Board.

MIDLAND DRY DOCK CO., MIDLAND, ONT.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONT.
Building six ships for the Canadian Government and six trawlers.

MUIR BROS.' DRYDOCK, PORT DALHOUSIE.
Repairing the wooden freight steamer "Windsor."

J. W. GEROW, ROSSPORT, ONT.

REID WRECKING CO., SARNIA, ONT.

DOMINION SHIPBUILDING CO., TORONTO, ONT.
Building six steel steamers, 3,500 tons, for undisclosed interests.

POLSON IRON WORKS, TORONTO, ONT.
"War Timiskaming" launching in February. Three steel steamers on stocks. "War Hamilton" completed and ready for sea.

PRINCE RUPERT DRY DOCK AND ENGINEERING COMPANY, PRINCE RUPERT, B.C.
Building two steamers for Canadian Government, 8,100 tons each.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONTARIO
"Canadian Trader," launched May 5th. "Canadian Sailor" to be launched about May 15th. Both vessels to be completed in June.

TORONTO SHIPBUILDING CO., LTD., TORONTO, ONT. (Toronto Dry Dock Co., Ltd., under same management.)

BRITISH AMERICAN SHIPBUILDING CO., WELLAND.
"War Weasel" delivered; "War Badger" completed; 2 steamers for Canadian Government, 4,300 tons each.

PRINCE EDWARD ISLAND

THE CARDIGAN SHIPBUILDING PLANT, CARDIGAN, P.E.I.
Building tern schooner, 160 tons, to be launched in October.

QUEBEC

R. N. LE BLANC, BONAVENTURE, QUE.

J. Z. DEGAGNE, EBOULEMENTS, QUE.

THE DAVEY SHIPBUILDING COMPANY, LAUZON, QUEBEC
Building fifteen wooden vessels of 1,500 tons for French Government. Two 5,100 ton steamers for Canadian Government. One keel laid. Operating Champlain Dry Dock. Building extensive new machine shops. Building six trawlers for Department of Naval Service.

ATLAS CEMENT CONSTRUCTION CO., LTD., MONTREAL, QUE.

CANADIAN VICKERS, LIMITED
Building five 8,100 ton steamers for Canadian Government. One 4,450 ton steamer for Canadian Government. One 8,300 ton steamer for French Government.

FRASER BRACE & CO., MONTREAL.
Eight wooden steamers for French Government, 1,500 tons each.
Four 5,100-ton steamers for Canadian Government.

H. H. SHEPHERD, SOREL, QUE.
Building four 1,200-ton wooden scows. No propelling power.
Rebuilding seven drifters. Particulars withheld owing to govt. restrictions.

HALL ENGINEERING CO., MONTREAL, QUE.

MONTREAL DRY DOCK & SHIP REPAIRING CO., MONTREAL, QUE.
Operate dock 428 ft. long 30 ft. deep.

MONTREAL SHIPBUILDERS LTD., 37 Belmont St., MONTREAL, QUE. (Associated with Atlas Construction Co.

THE QUEBEC SHIPBUILDING AND REPAIR CO., Board of Trade Bldg., MONTREAL, QUE.
2 vessels for undisclosed interests 3,000 tons each.

QUINLAN & ROBERTSON, MONTREAL, QUE. (Yards at Quebec.)
Four wooden steamers, for undisclosed interests.

LOUIS GAUNDRY, 12 St. Peter St., QUEBEC, QUE.

QUEBEC SHIPBUILDING & REPAIR CO., ST. LAURENT, QUE.
2 schrs. 1,400 tons and 1,200 tons.
One wooden four-masted auxl. schooner "Martin Connolly," 223 ft. x 42 ft. x 20 ft., 2,100 tons d. w., for undisclosed interests. Launched Oct. 28, 1917.

QUINLAN & ROBERTSON, QUEBEC, QUE.
Four wooden steamers, totalling 6,400 tons, for undisclosed interests.

CANADIAN GOVERNMENT SHIPYARDS, SOREL, QUE.
One steel vessel for undisclosed interests.

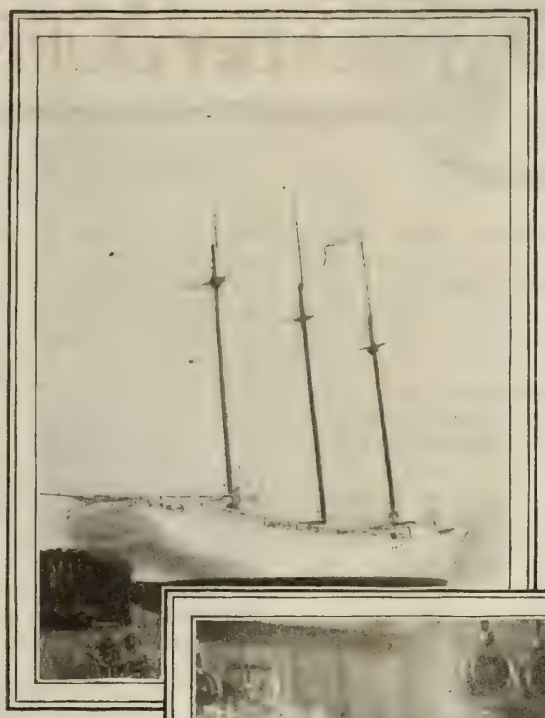
SINCENNES-McNAUGHTON LINES, SOREL, QUE.
One tug 410 tons, wood.

CAN. GOVERNMENT SHIPYARD, SOREL, QUE.
One steel vessel for undisclosed interests.
Building steam trawlers and wooden drifters for undisclosed interests.

TIDEWATER SHIPBUILDERS, LTD., THREE RIVERS, QUE.
Building four 1,500-ton steamers for Canadian Government. Two to be launched this season.

LECLAIRE SHIPBUILDING CO., SOREL, QUE.
Building drydock of 7,000 tons capacity.
Six steel trawlers 125 feet long with single screw triple expansion engines, 500 i.h.p. Two of these launched in November. One more to be launched before ice comes in. Six wooden auxiliary schooners fitted with twin screw "Skandia" engines of 120 h.p. each. These will be all in frame at the end of November and four ready for launching as soon as ice is clear next spring.

NATIONAL SHIPBUILDING CORPORATION, THREE RIVERS, QUE.
"War Mingan" and "War Radnor," launched Oct. 15 and No. 2. Built for the Imperial Munitions Board and will be operated by Anning Bros., Cardiff, Wales. Now building 10 self-propelling barges for France.



Auxiliary Motor Schooner "Samuel Courtney," 1918, equipped with 2-100 H.P. Fairbanks-Morse type "C.O." Semi-Diesel Crude Oil Engines.

Twin Screw, 7 Knots, 531 Gross Tons, 441 Net Tons, 171′ long, 35′ beam. Geo. M. Barr, Owner; Sam'l M. Courtney, Master; O'Brien Noel, N.S., Builder.



Twenty-three Days—Newfoundland to Greece

This is the record of the auxiliary Schooner "Samuel Courtney" and Mr. S. Courtney, her master, attributes it to her

Fairbanks-Morse "C.O." Engines

Fairbanks-Morse C.O. Engines have proved their economy, made possible by their using low priced fuels, and now the long distance speed record has been established. Each C.O.—30 to 200 H.P.—gives perfect regulation under all loads.

The Canadian Fairbanks-Morse Co. Limited

Halifax, St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
Winnipeg Saskatoon Calgary Vancouver Victoria

Marine News From Every Source

Buffalo, N.Y.—The grounding of the steamer Sonoma, loaded with grain and having a draught of 19 feet 6 inches, was caused by the moving of the buoys marking the channel.

Port Colborne.—The "Canadian Warrior," built for the Imperial Munition Board, made her initial trip through the Welland Canal on her way to Montreal, where she will load for Europe.

Collingwood.—The Collingwood Shipbuilding Co. successfully launched the steamer "Canadian Recruit." She was built to the order of the Canadian Government for their new fleet of carriers.

Midland.—The big fleet of American freighters that have been wintering in Midland have all sailed. They numbered sixty, and the place looks deserted, now that they have gone. The fleet was the largest in number that has ever wintered in the Georgian Bay.

Quebec.—The second launch to take place in two days was staged at the yards of the Davey Shipbuilding Company at Lauzon recently. This was one of the trawlers built there for the Department of Naval Service.

Vancouver.—The War Column was launched from the yards of the Coughlan Ship Yards, being the ninth of the 8,800-ton steel vessels built by these builders. The keel of an 8,100-ton Dominion Government steamer was laid on the vacated ways a few hours after.

Victoria. — The contract for the breechings and smokestacks for ten of the wooden steamships building by the Foundation Co. for the French Government have been awarded to the National Steel Construction Co., of Duwanish Waterway, Seattle. The work is under way.

Quebec. — News has been received from Cap St. Michel that the "War Toronto," built by the Toronto Shipbuilding Co. last fall, had gone aground while on her voyage to Quebec. The "War Toronto" was on her way to Quebec to load lumber for England. She was one of the wooden steamers built for the Imperial Munitions Board.

London.—While en route from Windsor to Ottawa the Hon. F. B. Carvell stopped off here to hear the claims of London, St Thomas, Middlesex, and Elgin for harbor improvements. He went down to Port Stanley on a special train of the L. & P. S. R., accompanied by a delegation led by Sir Adam Beck, chairman of the Londor Railway Commission.

Quebec.—The steamer "War Toronto," which went ashore on her passage to Quebec, has been refloated, after a few days on the ground. After being pulled off she proceeded to Quebec under her own steam.

Victoria.—The contract for rigging the twenty wooden steamers being built by the Foundation Company has been awarded to Haviside, Withers & Davis, ship riggers, of San Francisco, and Frank W. Haviside will be in charge of the work. The labor employed will all be local, through the Foundation Company's organization.

Watertown, N. Y. — The excursion fleet on the St. Lawrence and among the Thousand Islands, will be limited again this year, despite the end of the war. The Canada Steamship Lines have announced that the service will be the same as that of last year. Connections between Clayton and Alexandria Bay will be maintained by the Island Belle and Riverside, passing through the famous American channel between Clayton and the Bay.

Welland. — The "Cherokee" of the Canada Steamship Lines, Montreal, coming down loaded with coal, collided with the M.C.R. bridge, and had about 12 feet of her bows stove in. A long train was on the bridge, preventing it from being swung, and the current was too strong to stop the "Cherokee" quickly enough. The "Cherokee" will be towed to Port Colborne stern first, and navigation re-opened immediately.

Victoria. — The Foundation Company have launched the fourth of their wooden steamers for the French Government, the "Winnipeg" being the latest to take the water. She is a 3,000 ton, full powered, wooden steamship, and is the fourth vessel to be launched in the past two months. The "Strasbourg," "Metz" and "Mulhouse" are the names of the other three. The Foundation Company's band lent gaiety to the occasion.

St. John, N. B.—The winter season just ended has been a record one. The amount of wheat shipped during the winter was 19,956,000 bushels. The season was opened on November 23 last, by R.M.S. Tunisian, which loaded in St. John, after bringing over troop dependents and civilian passengers. She was the first of a total of 222 ocean going freight steamers. Nearly 25,000 returning troops have been welcomed at the port, and as the Board of Trade Journal proudly states, "The port of St. John was never closed an hour during the war."

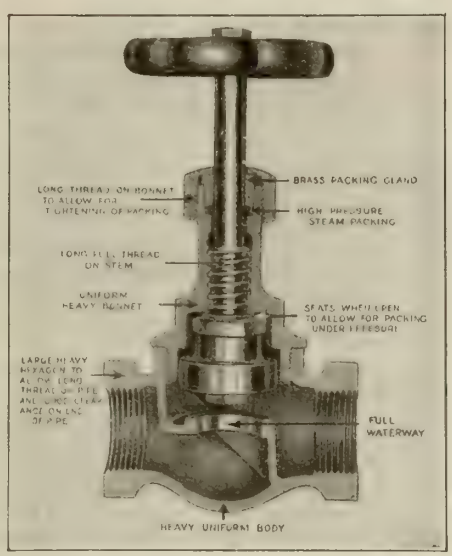
Victoria, B.C.—The first ship to be launched from the Cholberg Yards was the schooner "Gunn," built to the order of Porsgrund, Damp & Seil Co., of Porsgrund, Norway, a vessel of 1,500 tons. She has been already chartered through the Universal Shipping & Trading Co. to load 1,200,000 feet of lumber for Europe, and will be ready for loading very shortly. The masts will be stepped under the shear legs of the Victoria Machinery Depot.

Montreal.—The Canadian Government Merchant Marine will be inaugurated here very shortly. The Government has taken over shed 24 on the harbor front, and H. Milbourne, marine superintendent of the Government line, has opened an office there. The "Canadian Ranger" and the "Canadian Pioneer" will be the first vessels on the service. They are 8,100 ton vessels. It is hoped by the middle of the season to have 20 vessels in service. The first cargoes will be Canadian produce for West Indian ports. The return cargo of the first vessel will be sugar from Havana.

Midland. — The "War Magic," the second boat to be constructed by the Midland Shipbuilding Co., was successfully launched, under conditions closely resembling those of the 24th October last, when the "War Fiend" was dropped into the bay. A cold wind was blowing and rain falling on both occasions. The "War Magic" is of the usual canal sized freighter type, and was built for the Imperial Munitions Board. She is for transatlantic service, her sister ship, the "War Fiend," has already made one trip to Sicily with a cargo of grain. The "War Magic's" machinery was built by the John Inglis Co., of Toronto.

Sydney, N.S.—The prospects for the St. Lawrence coal trade are not bright, according to officials of the Dominion Steel Corporation. Three vessels having a tonnage of 45,000 which are owned by the Dominion Coal Company, are now employed by the British Government in transporting grain from Australia to England, while, according to report, Canadian grain elevators are filled to overflowing. One vessel is used as a transport between the United States and England and England and Italy, while another vessel has been carrying cargoes from South America to Holland for the Dutch Government. The latter vessel will now be most of the summer undergoing repairs.

Waste of Time and Money



WHEN overhauling your equipment, don't patch up the worn parts, it wastes time, labor and money—to say nothing of reduced plant efficiency, and lower turnout.

Everything wears out in time, even if it does take years to happen, and renewals **must** be made.

About your valves—if those you have installed do not do their job, don't tinker with them—it will cost you more money than they are worth.

Get "EMCO" Valves—They have nine points of superiority—The accompanying cut will show you this.

"EMCO" Valves are guaranteed efficient, strong and durable—The design is approved and registered in the Provinces of the Dominion by Inspectors in the Steam Boilers for a working pressure of 175 pounds—They are made of the best Bronze Metal—Each valve is subjected to a thorough hydraulic test before leaving our factory.

Registered in the following Provinces as follows:

GLOBE VALVE A840

British Columbia	No. 2590
Alberta	No. 1102
Saskatchewan	No. 2365
Ontario	No. 1755

Look for the word "EMCO" on each valve.

Write for our Catalogues—They contain valuable information you no doubt require.

EMPIRE MANUFACTURING CO., LIMITED

LONDON AND TORONTO, CANADA

BUILDING AN OIL BOAT

The current number of the "Shipyard," the works magazine of Messrs. Swan, Hunter, and Wigham Richardson, is, as usual, a bright and interesting publication. A most amusing article on the "San Florentino," the world's largest oil boat, built by the Neptune firm, is published. Mr. Chas. H. Kirkby, the writer of the article, appears to have found the humorous side of the serious work of shipbuilding. He says:—

With the completion of the steamer San Florentino comes the solution to questions which have puzzled many workmen at this yard. Very few seem to understand what an oil boat really is. Let us explain.

An oil boat is a series of pipe-leads running in all directions. Round these have been erected iron walls, which, by some subtle means, have so met that we have a number of compartments varied in size and kind, while, outside of all, we have the outer wall or hull. But the greatest mystery are these pipe-leads. Wherever you go they are to be seen. Beginning in the lowest regions, they play hide and seek with one another, till finally they all emerge on deck somewhere, and after a perfect scamper from bow to stern they tamely end nowhere in the most amazing fashion. From several sources I learn that fitters erected these pipe-leads, and then to make it very difficult for anyone to grasp the game, they put in objects which stop or divert whatever runs in the pipes. These objects they call valves.

Having got together as much piping as the ship can carry, and so fixed the valves that by a single turn on certain rods the oil lamp will be lit in the stewards' cabin, the erectors then begin what seems a most amazing performance. Several compartments are filled with water (goodness knows were they get it), this operation being closely inspected by a great many persons. Then someone is "set on" to throw this water out into the river, which we conclude is done to find out how much water each room will hold.

'Tis then one sees clearly the folly of fitting valves. For, while the test is in operation, someone, for unknown reasons, opens a valve, and off runs the water to all parts of the ship. Men come from far and near to tell of its travels, and lucky indeed is he who succeeds in catching it again. This game goes on till every compartment in the boat has shown that it is possible to transfer all the water from it to the captain's cabin. Then all engaged on the test shake hands, say what a good ship it is, and retire perfectly satisfied.

No one seems to have thought fit to ask what is done with the oil carried by the ship, though one fitter suggested it might be intended for oil lamps used by the ship's engineers when dealing with pipe joints.

Such then is an oil boat. Having seen men filling oil compartments from barrels by means of a funnel and strainer, it seems to me possible that some mechanical means might be used, but perhaps it will not be advisable to rush things until the hours question is settled.

The manner of oil boat building is, of course, very simple when once the tonnage of pipe line is settled. How it works one must leave to the sea trials to discover. Whether the valves are all open at once and the ship filled to the utmost capacity, so that the running over may be carefully checked in quality and quantity, or whether the oil filled in from the barrels and funnel is supposed to find its way up on top of such water as leaks into the ship, one cannot yet say, but it does seem strange that so many buckets should be taken on a trial trip.

These are the salient points in an oil boat and the engineer of the future has in the contemplation of them full scope for his inventive genius.

St. John, N.B.—A steamship service, served with three steamers, will soon be operating between St. John and New York. The steamers will carry about three hundred tons each trip, and one will be en route, one loading at New York, and one unloading at St. John through the season.

London.—Five million feet of lumber are being made up into a huge raft which will be fitted with internal combustion engines and have accommodation on the deck for the crew. She will make the voyage to England through the Panama Canal, and when she reaches home will be dismantled and the timber distributed.

Cleveland.—There is quite a heavy demand for tonnage in the grain trade, and Julius Barnes of the United States Food Administration Grain Corporation has notified the Mobilization Committee of the Lakes Carriers' Association that boats to load 10,000,000 bushels will be wanted in the Lake Superior trade this month.

London.—It has been stated by the London Post Office that tests made in 1905 and 1906 proved that British mails landed at Sydney and forwarded by rail reached their Canadian destination a day earlier than by the St. Lawrence route. The Canadian Government is said to be considering the advisability of adopting Sydney as the permanent port for landing mail.

Victoria.—The official list of 23,000 ton full-powered wooden steamers under contract here for the French Government by the Laing Co., was announced. The company already has launched the Strassbourg, Metz and Mulhouse. The remaining ships are as follows: Canada, Montcalm, Wilfrid Laurier,, Ottawa, Winnipeg, Frontenac, Lasalle, Acadie, Montmagny, Alberta and Nouvelle Ecosse.

Montreal.—A company was incorporated last week, to be called the Canada Transatlantic Company, Limited, with a capital of $1,000,000. The company will be a connecting link between the Canada Steamship Lines and the Compagnie General Transatlantique. It will operate six steamships between French and Canadian ports of about 6,000 to 8,000 tons deadweight. The service will be put in operation about June next. This should lead to a large development of trade between Canada and France.

Washington.—The Shipping Board has formally approved of rates for shipment on the Great Lakes of coal, ore and grain. A meeting was held of the Shipping Board, the Food Administration Grain Corporation, and representatives of vessel owners and shippers. The rates agreed upon are as follows: Ore 80c per ton; coal 42½c per ton, and grain from Lake Superior to Lake Erie and from Lake Michigan to Lake Erie, April and May loading, 3½c and 3c respectively; September, October and November grain loading including winter storage of vessel 5c. The grain rates to Georgian Bay and Goderich were fixed at ½c per

TURNBUCKLES, SHACKLES, OAKUM, CAULKING COTTON

R. B. WING & SON

4-6 Liberty St. Albany, N.Y.

POSITION WANTED

SHIPBUILDERS, SHIPOWNERS OR ANY OF the classification societies requiring the services of a fully qualified Ship Surveyor. 25 years' service under the British Board of Trade Marine Department, in Surveys of Passenger Certificated Steamers, Tonnage and Freeboard. Recently completed contract appointment as Ships' Surveyor to the Imperial Munitions Board of Canada (Shipbuilding Dept.). Correspondence invited. J. H. Thomas, 405 Markham Street, Toronto, Ont.

FOR SALE — THE CURTISS-WILLIS CO., 30 Church St., New York. 8—360 H.P. Duesenberg Marine Engines, new, each $3,000, cost $5,600. 4—240 H.P. Diesel Engines, new, each $15,000, cost $31,313. 6—100 H.P. Fairbanks-Morse Semi-Diesel Marine Engines, new, each $7,000. 2—25 H.P. Fairbanks-Morse, stationary, new, each $1,500. 1—72-ft., 35-mile, motor boat, new, cost $55,000, price $15,000. Also motor boats, chain, anchors, wire rope and marine equipment.

SIX NEW DOUBLE CYLINDER, SINGLE DECK winches, 8" x 10", reversible link motion, compound gear, four winch heads. Lifting capacity seven tons on single line; shipping weight seven thousand three hundred pounds. Immediate shipment. Price fifteen hundred dollars each. Further information on application. The National Shipbuilding Co., Ltd., Goderich, Ont.

FOR SALE OR CHARTER

PASSENGER AND FREIGHT STEAMER, length one hundred and eleven feet; beam twenty-four feet; depth eight feet five inches. Fore and aft compound engine 13 x 26 x 18 stroke, boilers steel, 125 lbs. steam, British registry; gross tonnage 328 tons; register tonnage 223; speed nine miles; hydraulic hoist; passenger accommodation forty. Apply Box 155, Marine Engineering.

PAGE & JONES

SHIP BROKERS AND STEAMSHIP AGENTS

MOBILE, ALA., U.S.A.

CABLE ADDRESS: "PAJONES, MOBILE." ALL LEADING CODES USED.

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To Masters, Officers and Seamen of the Merchant Service :

The Merchant Service is not a bed of roses.
BUT IT CAN BE IMPROVED, and the improvement must come from within.
YOU ARE THE MAN TO DO IT.
Of course, you cannot do it yourself, but your co-operation with your co-workers will help.

JOIN THE C.M.S.G.

It consists of men like yourself, who realize that improvements are necessary.
Don't let someone else do the fighting, while you reap the advantage.

COME AND HELP

APPLICATION FORM

FOR THE CANADIAN MERCHANT SERVICE GUILD

To the Secretary of The Canadian Merchant Service Guild, Collingwood, Ont.:—

I wish to be enrolled as a Member of the Guild. Herewith is my first subscription. Please send receipt by return post.

NAME IN FULL..... Home Address.....

No. and Grade of Certificate.....Rank..... Name of Ship.....

Associate Member's NAME in full..... ....

Home Address..... ....

Amount $..... Date.....19

Subscription, including legal defence, is $10 for captains; $8 for mates and pilots; $6 for wheelsmen, and without legal assistance $7 for captains; $5 for mates and pilots; $4 for wheelsmen. Any of these members who may not be actively engaged at their professional duties during the season of navigation will be required to pay $3 per year to retain his membership. Associate members will be required to pay $2 per year, and may consist of any British subject domiciled in Canada interested in the safety and prosperity of our trade and commerce with the outside world.

These subscriptions will become due the first day of the month in each year in which the member joins.

bushel; Port Huron ½c per bushel, and Collingwood ½c per bushel under the Lake Erie rate. The rate to Detroit was made the same as to Lake Erie ports.

Goderich.—Captain R. F. Pyette, of steamer Sarnian, was presented with a hat by the members of the Town Council of Goderich in honor of being the commander of the first steamer to enter the harbor this season. As his ship was also the first arrivals at Port McNicoll and Port Arthur this is the third hat he has received this season. The Sarnian had a cargo of wheat from Fort William. The captain said that the harbor of Goderich had been greatly improved by the outside breakwater, and he had no trouble in making port with a draught of 19 ft. 6 inches. The harbor could be still further improved by the extension of the north breakwater for 300 feet, and by slightly deepening the inner harbor. As it was it was the only safe harbor on Lake Huron for vessels of large draught.

Collingwood.—With the passing of Capt. Samuel Crangel, who died in California recently, a well-known figure in Great Lakes shipping circles has been removed. Deceased was 80 years of age and was one of the oldest masters on the lakes and had spent over 30 years of his life building freighters, among which were the Rosedale, G. R. Crow, W. D. Mathews, James Carruthers, and J. H. G. Hagerty. He was superintendent of the St. Lawrence and Chicago Steam Navigation Co., Vancouver. At a meeting of the Board of Trade held recently shipbuilding conditions were reviewed and a resolution was passed urging upon the Dominion Government the necessity of keeping its promises regarding ship construction on the Pacific coast. Mr. Tiers, secretary of the Wallace Shipbuilding Co., and Mr. J. J. Coughlan, both stated that the Government, when refusing the yards permission to take orders for foreign tonnage, had promised that they would be kept busy for at least three years on Government construction.

Detroit.—Establishment of a World Peace Exposition in Detroit that will eclipse all World Fairs ever held in this country is planned. Announcement of the project was made by Mayor Couzens. The organization of the Exposition will be under the direction of Charles M. Schwab. Two or three years will be required to put the Exposition in shape, thus setting the date at 1922 or 1923. Millions of dollars will be required. Fred J. V. Skiff, director of Field Museum of Chicago, will draw plans for the Exposition. Mr. Skiff was manager of the Chicago, Buffalo, St. Louis and San Francisco Fairs. Charles M. Schwab has consented to come here, it is understood, and take the organization of the Exposition in hand. His record during the war in whipping the United States Government's shipbuilding program into shape is considered a guarantee of success.

Montreal. —. The coming visit of Col. Grant Morden, the organizer of the present combination of steamships, has given rise to talk of a gigantic merger of British and Canadian steamship interests. The Canadian steamers would be of use as feeders on the inland waterways. Col. Morden is a member of the Canada Steamships London executive, and is understood to represent the London interests who advocated a higher dividend on the common stock than the four per cent. recently inaugurated .

Toronto.—The "Cayuga" opened the Toronto-Niagara season when she made her first trip to Niagara on the 17th of this month. The Canada Steamship Lines announce that the regular two-boat service will not start until June 14, when the "Chippewa" will also be placed on the run. The "Kingston" and "Toronto" will open the Thousand Islands run on June 14, running on Mondays, Tuesdays and Saturdays to the end of the month, when the daily service will start. During the war the tourist traffic on this route was poor, but is expected to pick up this summer.

Ottawa. — The Dominion Government will continue its shipbuilding programme through 1919 and 1920, according to a statement in the House by Mr. C. C. Ballantyne, Minister of Marine and Fisheries. The occasion was the bringing forward of an estimate for $30,000,000 to complete the program already announced. The Minister emphasized the fact that the number of ships that the country could use was limited, and that they were very near the limit now. He said that the number of men now employed in the shipbuilding trades was 46,000, and it would be a dangerous thing for any Government to throw that number of men out of employment. This consideration would influence the Government in placing further orders.

Vancouver. — Speaking before the Mathers Commission in Vancouver recently, J. J. Coughlan, of the Coughlan Ship Yards, gave his opinions of the present troubles and the future outlook of his industry. A heavy handicap against shipbuilding, he said, was the heavy freight rates, and the high cost of labor. The unrest in labor circles he attributed to the fact that many of the Union officials were Socialists, and in some cases violent Socialists. A hopeful feature of this condition, however, was that the Reds were losing prestige in the eyes of the men, because they were going too far in their demands. The presence of a man like Gompers or Peter Wright for a couple of months, would be of great help in improving conditions, in the opinion of Mr. Coughlan.

Ottawa.—Representatives of shipbuilding companies located at various points in Canada from Port Arthur eastwards and of the Shipbuilding and Marine Federation, the shipyards employees' organization, who have been in conference here for several days have, it is understood, reached a basis of understanding on questions at present the subject of negotiation. They have divided into committees which will visit the yards of the various districts to consult employers and employees. One committee will go to Collingwood, Midland and Port Arthur, for instance, and another to Toronto and other points in Central Ontario, where shipyards are operating. The Shipbuilding and Marine Federation, on behalf of the employees, is asking for wage increases and for a forty-four hour week.

Ottawa. — By an order-in-council the Government has made traffic on the canals possible. This does not apply to all canals, and to only a portion of the day to those mentioned. Employees will not be compelled to work on Sunday, but those willing to do so will receive an extra twenty cents per hour. Following are the waterways and hours between which they will be available for Sunday traffic:

The Ottawa River canals and the Rideau canal, except from Pretoria Ave. bridge, Ottawa, to Manotick, between 6 a.m. and 9 p.m. on Sundays, and between Pretoria Avenue bridge and Manotick, the route to the Rideau lakes, from 5 o'clock to 10 each Sunday morning, and from 2 p.m. on.

On the Trent canal, locks No. 7 at Glen Ross, No. 18 at Hastings, No. 19 at Peterboro, No. 27 at Young's Point, No. 32 at Bobcaygeon, No. 35 at Rosedale, Lindsay lock, Port Severn lock, and the Marine Railways at Big Chute and Swift Rapids, together with the associated bridges, from 7 o'clock to 11 on Sunday mornings, and from 5 to 9 o'clock in the evenings.

First Coal Cargo.—The Dominion Coal Company's steamer, "Lingan," with a cargo of 7,000 tons of Nova Scotia coal, has arrived in Montreal, being the first coal boat of the season to reach there. The steamer Hochelaga, of the same service, is also due with a similar cargo. It is the expectation of the company to expedite the shipment of coal this season in order to obviate the heavy exports from the United States which were forced on the country by war conditions. This should operate to a marked extent in correcting the heavy adverse trade balance between the two countries.

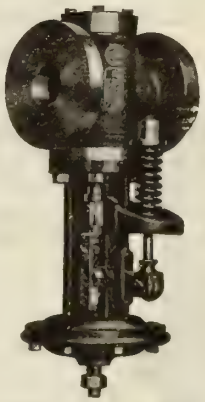
TORONTO. — The Board of Control adopted a motion by Controller McBride, aimed at contractors who are not Canadians. It was in the following terms and carried unanimously: "That during the reconstruction period, and until further action hereon is taken by the city council, no contract for the construction of any public work undertaken by the city shall be awarded to any person or company that were not bona fide residents or ratepayers in the Dominion of Canada continuously since 1914." After this Controller McBride strongly opposed awarding a contract for the St. Clair avenue storm sewer, at $73,165, to E. L. Reynolds, a former citizen of Cleveland, who has been living with his son here since 1912 "I intend to be a citizen of Toronto and I have made my home here," said Mr. Reynolds.



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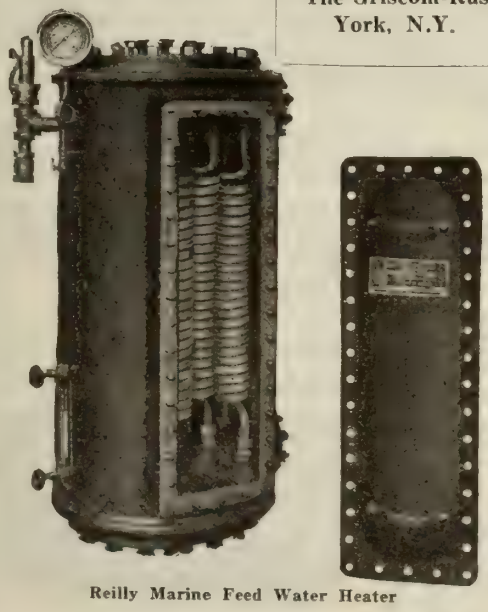
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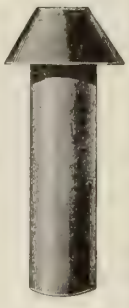
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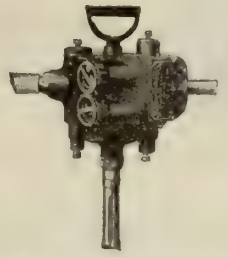
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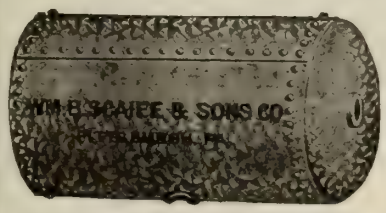
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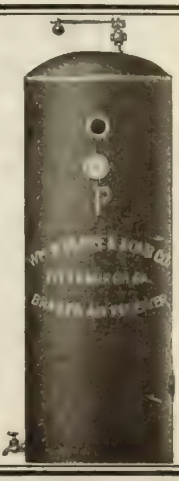
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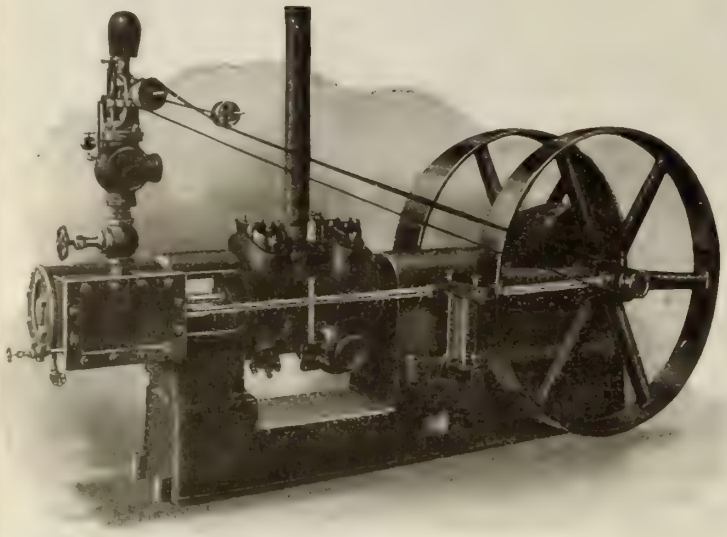
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THE FINANCIAL POST in the House of Commons

IN the House of Commons the other week the attention of the Government was drawn to the article in THE FINANCIAL POST containing a reference to the financing of Roumanian orders through an agency established in London by Sir Clifford Sifton. Sir Thomas White, who is familiar with THE FINANCIAL POST, stated his opinion that the reference was to the private marketing of bonds.

This is merely a small item from THE POST of April 26th, but it goes to show that

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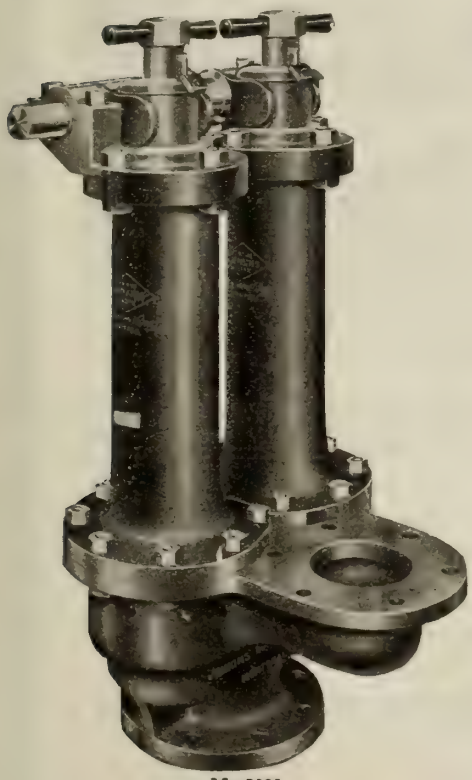
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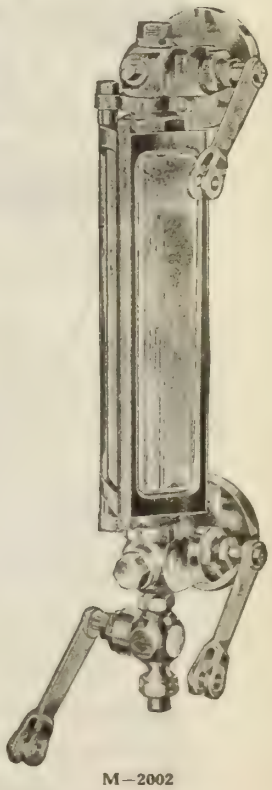
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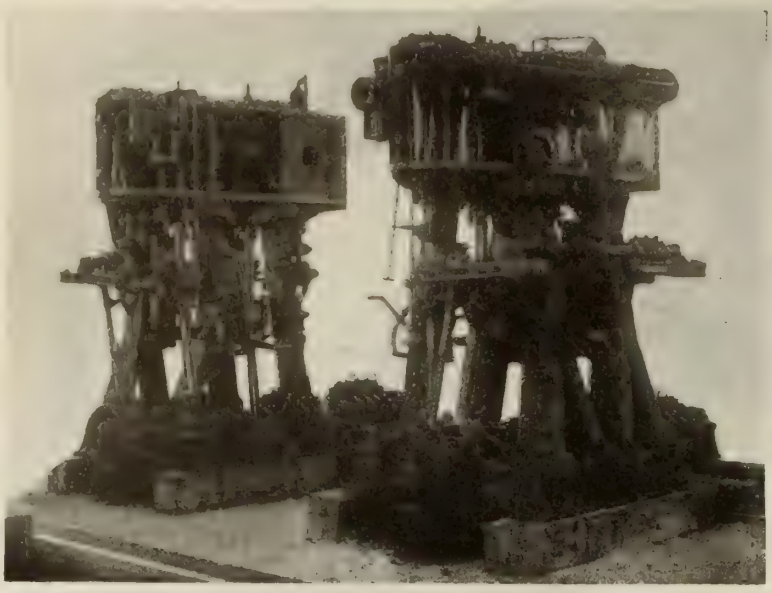
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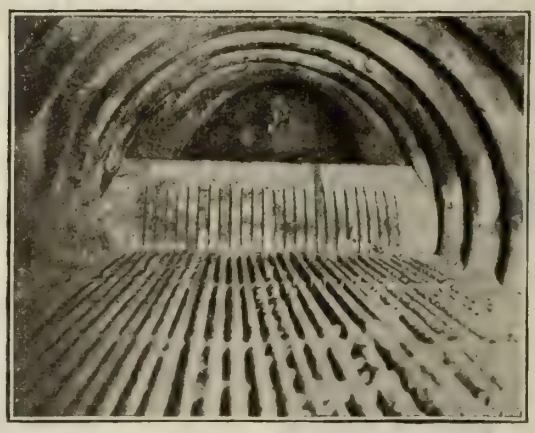
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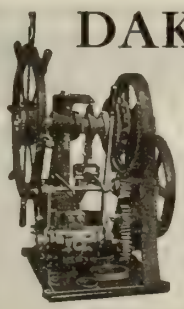
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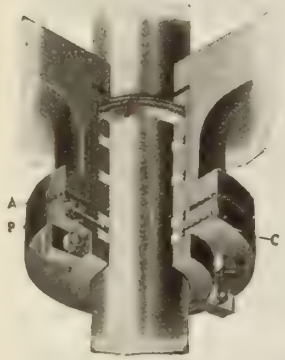
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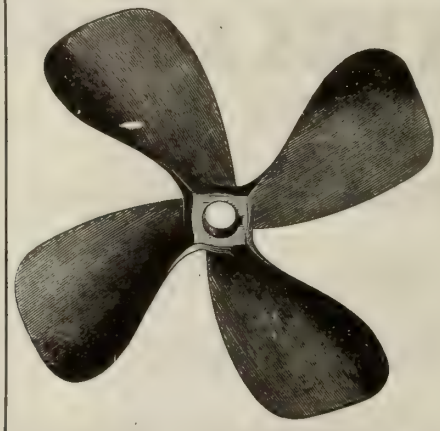
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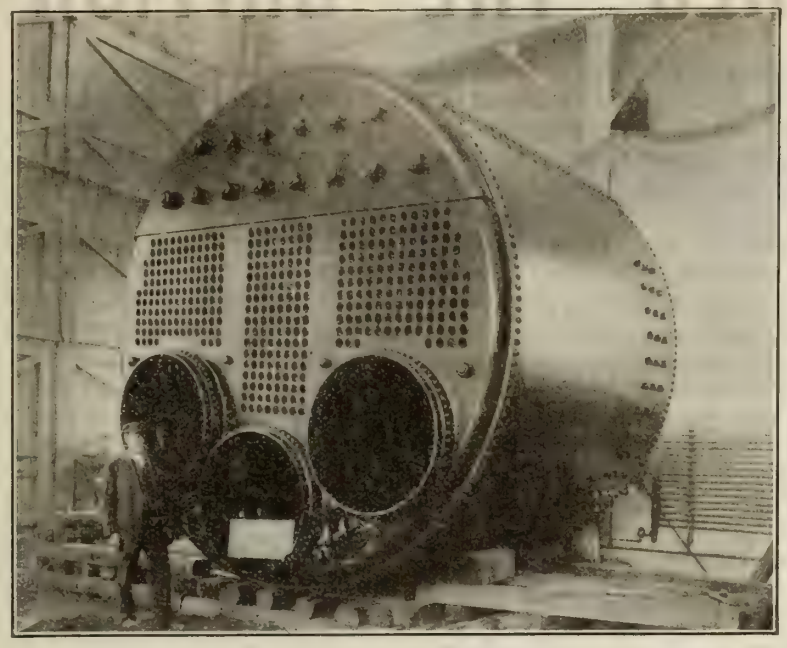
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WILSON FEARED THE BRITISH

THE American President crossed the Atlantic in the first place with the idea in his mind that his ideals would be thoroughly in accord with those of the French statesmen; but he was rather afraid of a conflict with the British delegates. He found in reality that his plan for peace terms was as far removed from the French plan as the two poles. Then he crossed to London and was surprised to find that the ideas of the two Anglo-Saxon powers were identical.

This situation, according to J. W. Dafoe in the May issue of MACLEAN'S MAGAZINE, explains much that has developed at Versailles. Further, it contains the promise of a close *rapprochement* between the two great English-speaking democracies for all time to come.

Mr. Dafoe has contributed a remarkably interesting article to this number of MACLEAN'S, lifting the curtain on many of the puzzling situations that have arisen overseas. As the editor of the Manitoba *Free Press*, he is the dean of Canadian newspapermen; as the representative of the department of Public Information on the Canadian Mission to the Peace Conference, he was in a special position to learn what was transpiring. He tells of the really big part that Canada has played in the Proceedings and points out that Canada's status as a nation was firmly established in the eyes of the world when she was allowed separate representation.

A Dozen Other Features---Nationally Important

This May issue is full of articles of unusual significance for Canadian readers.

"SOLVING THE PROBLEM OF THE ARCTIC"
—By Vilhjalmur Stefansson

The second instalment of his remarkable story of the four years of exploration that he undertook for the Canadian Government in the region of the "Pole of Inaccessibility"—a harder place to reach than the North Pole.

"ORGANIZING FOR PEACE"
—By George Pearson

An article of the Great War Veterans' Association by a well-known author-soldier.

"THE CANADIANS IN SIBERIA"
—By Capt. W. E. Dunham

A graphic story of what our forces did in combatting the Bolsheviki, by an officer who has just returned.

"SAFE IN THE SADDLE"
—By J. K. Munro

A review of affairs at Ottawa in which the opinion is expressed that Union Government for the time being is safely entrenched.

The National Idea

The articles in this issue of MACLEAN'S reflect the national idea—Canada's part in the Peace Conference, the political situation at Ottawa, the exclusive report of Stefansson's national explorations, the national organization of our returned men, the work of our forces in Siberia. The reader of MACLEAN'S gets a broad idea of what Canada as a whole is doing. The value of this issue— and of all issues —is very great, therefore, from an educational standpoint.
MACLEAN'S is the one magazine that should be selected for young Canadians to read.

Four capital stories by famous authors—W. A. Fraser, Lloyd Osborne, Frederic S. Isham and C. W. Stephens.

The Review of Reviews

An unusually fine array of articles is given in this department, selected from the best in magazines and periodicals the world over. Some of the titles are:

Planned to Destroy British Fleet.
How Mackensen Was Caught.
Events of War Foretold by Stars.
What is Life Like Beyond the Grave?
A High-born Bolshevik.
The New Life in Dry America.
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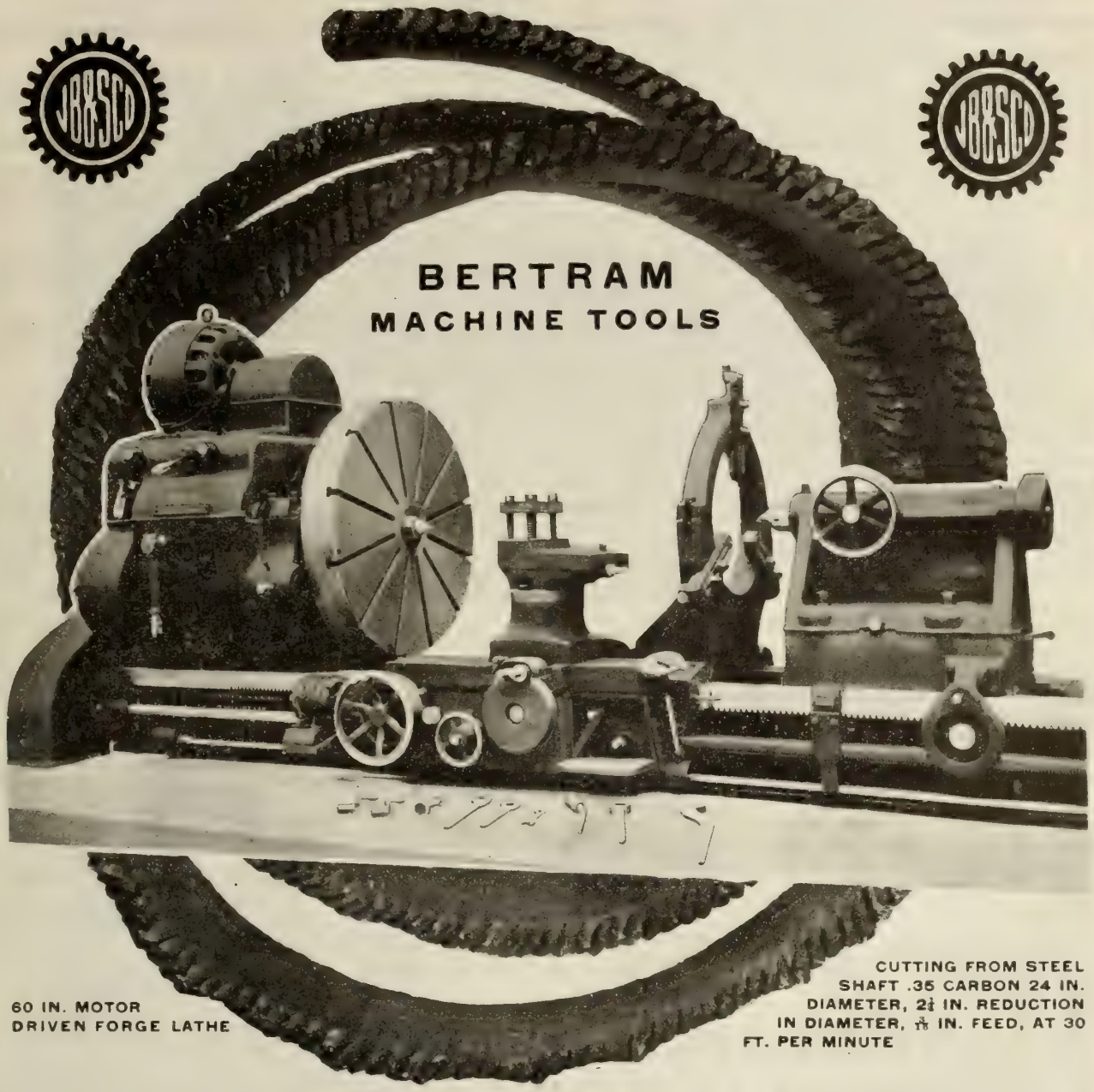
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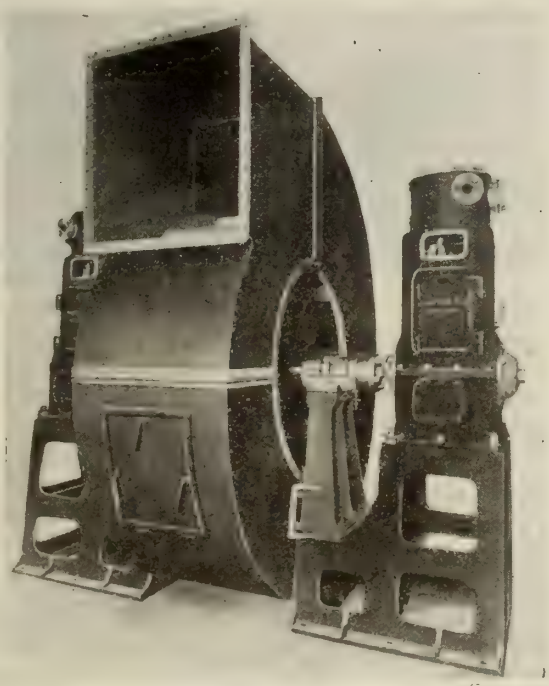


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Wilkinson & Kompass, Hamilton, Ont.

GRINDERS, PLAIN
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The Sperry Gyroscope Co., Brooklyn, New York.

GYRO-STABILIZERS
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GRINDERS, MOTOR-DRIVEN
Canadian Fairbanks-Morse Co., Montreal Que.
Ford-Smith Machine Co., Ltd., Hamilton, Ont.

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Dennis Wire & Iron Works Co., London, Ont.

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Independent Pneumatic Tool Co., Chicago, Ill.

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Independent Pneumatic Tool Co., Chicago, Ill.

GRINDERS, WATER TOOL
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Canada Foundries and Forgings, Ltd., Welland, Ont.

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Mitchell Co., The Robert, Montreal, Que.

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Tallman Brass & Metal Co., Hamilton, Ont.

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Darling Bros., Ltd., Montreal, Que.
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Babcock & Wilcox, Ltd., Montreal, Que.
Goldie & McCulloch Co., Galt, Ont.
Mason Regulator & Engin. Co., Montreal, Que.
McNab Co., Bridgeport, Conn.
Row & Davis Engineers, Inc., New York, N.Y.

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Mitchell Co., Ltd., Robt., Montreal, Que.

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Beatty & Sons, Welland, Ont.
Waterous Engine Works Co., Brantford, Ont.

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Independent Pneumatic Tool Co., Chicago, Ill.

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Dake Engine Co., Grand Haven, Mich.
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Hopkins & Co., F. H., Montreal, Que.
Waterous Engine Works Co., Brantford, Ont.

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Can. Ingersoll-Rand Co. Sherbrooke, Que.

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Morrison Brass Mfg. Co., James, Toronto, Ont.

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Mitchell Co., The Robert, Montreal, Que.
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Tallman Brass & Metal Co., Hamilton, Ont.
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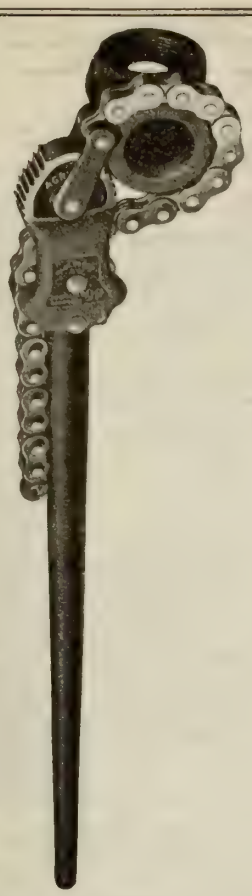
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McNab Co., Bridgeport, Conn.
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McNab Co., Bridgeport, Conn.

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Darling Bros., Ltd., Montreal, Que.
Mitchell Co., The Robert, Montreal, Que.
Smart-Turner Mach. Co., Hamilton, Ont.

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Can. Fairbanks-Morse Co., Montreal, Que.
F. H. Hopkins Co., Montreal, Que.
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SCREWS, RIGGING AND STEERING
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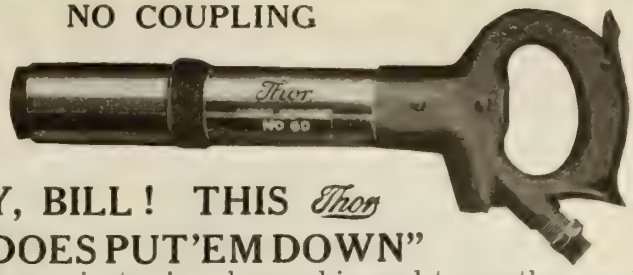
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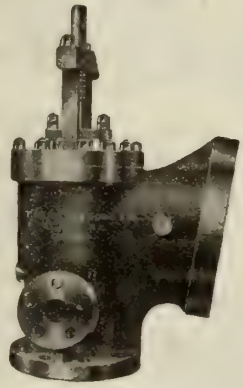
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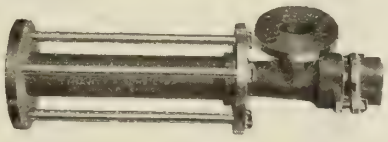
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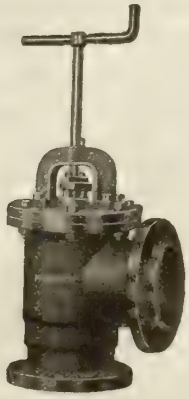
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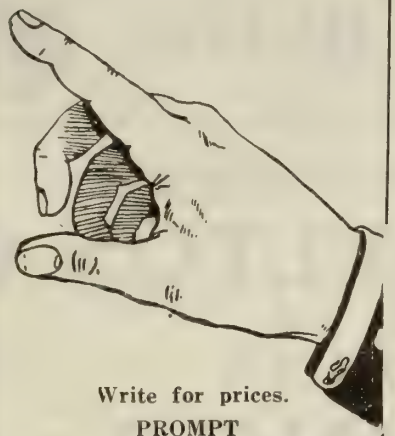
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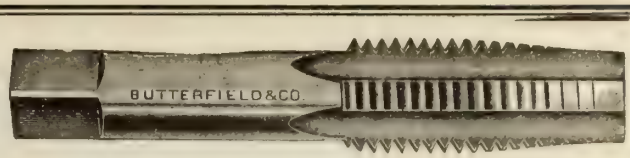
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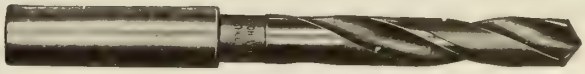
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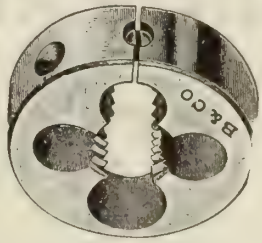
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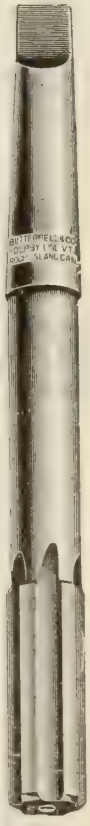




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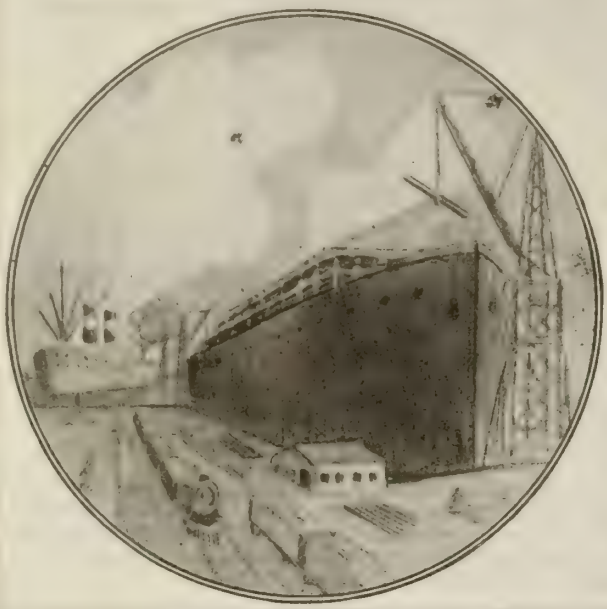
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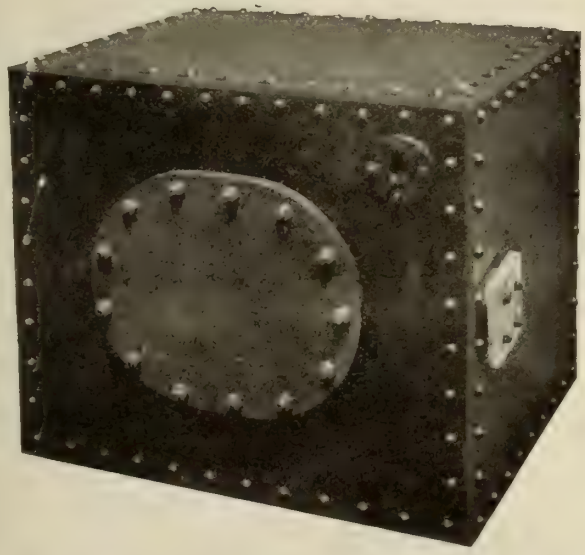
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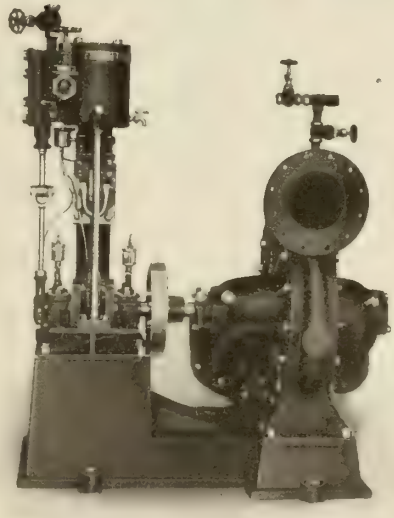


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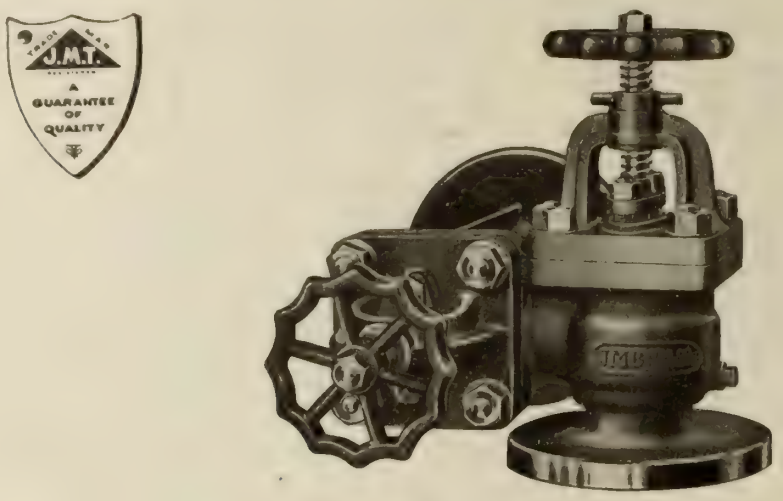
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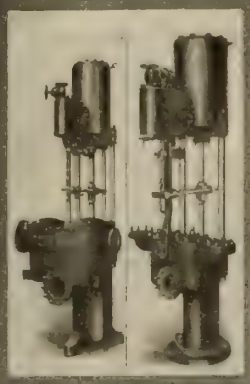
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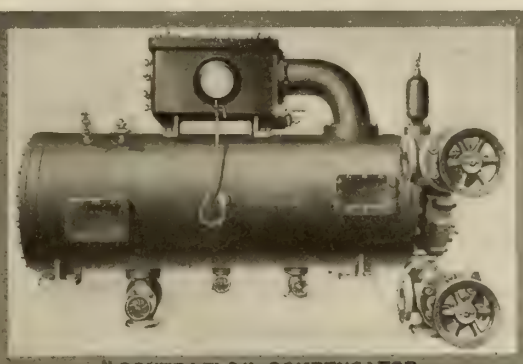
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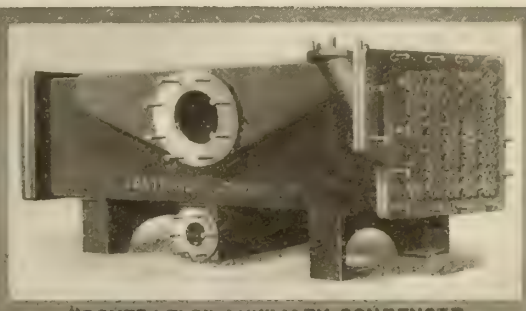
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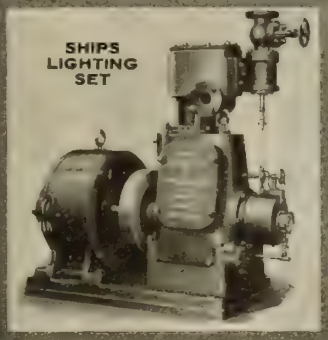
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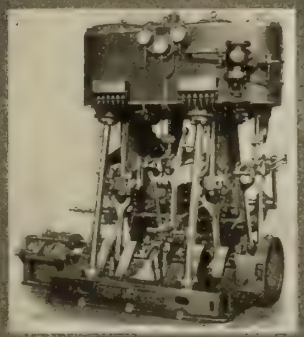


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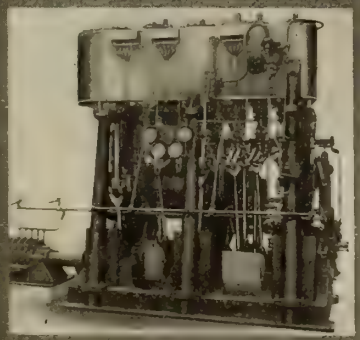


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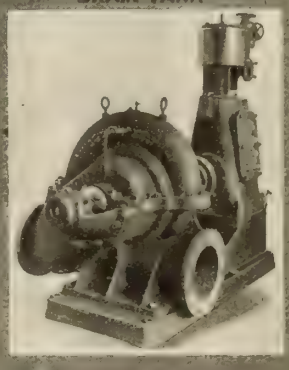
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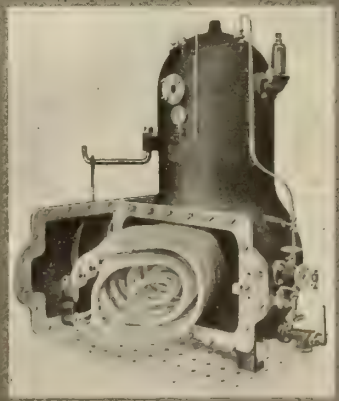
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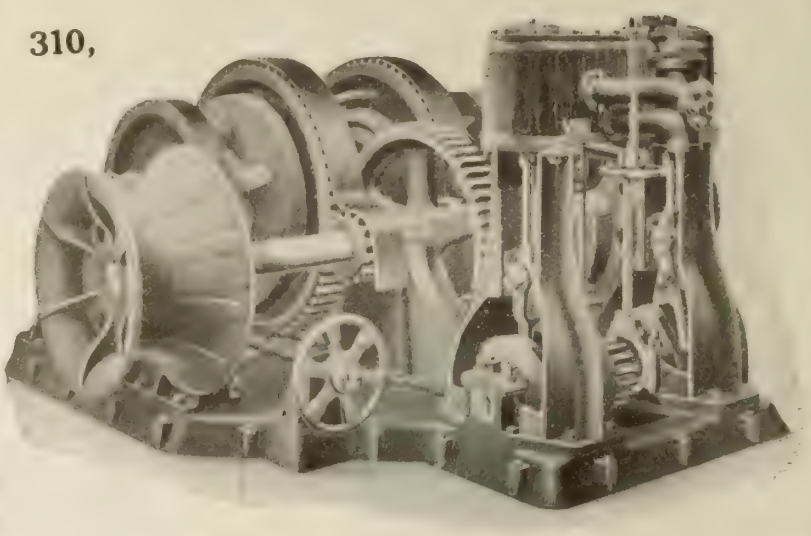
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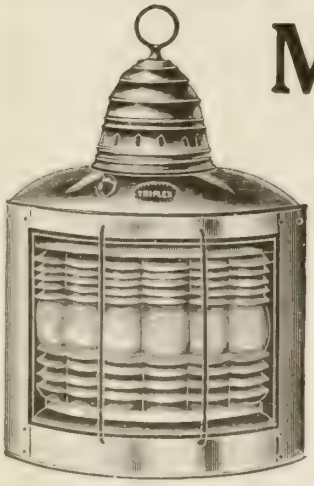
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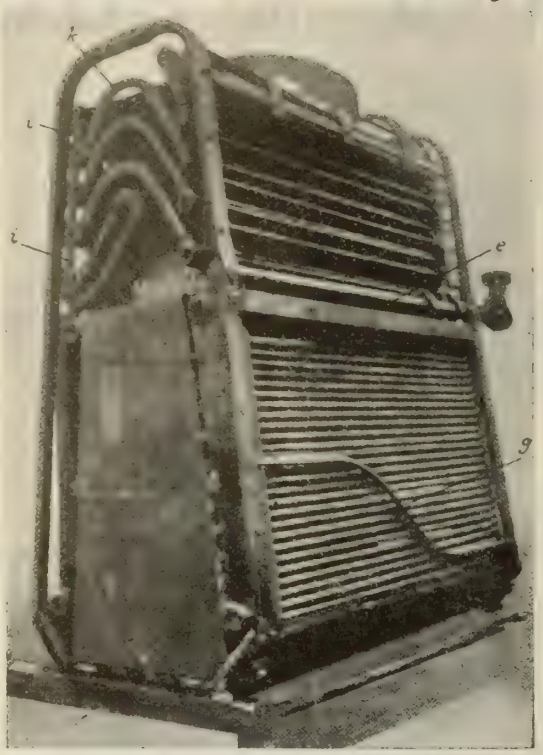


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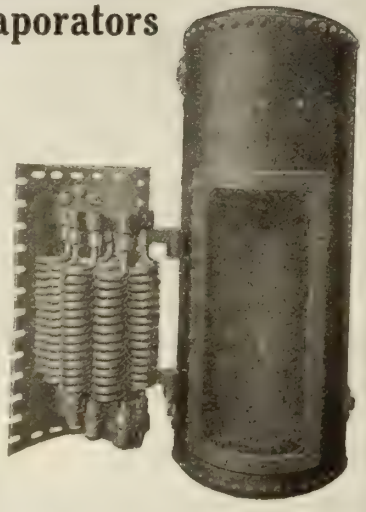
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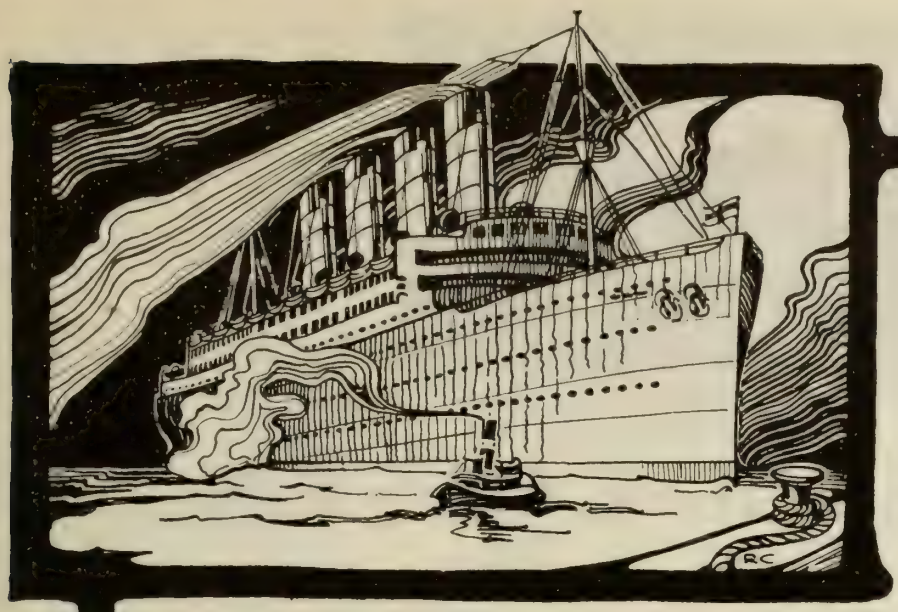
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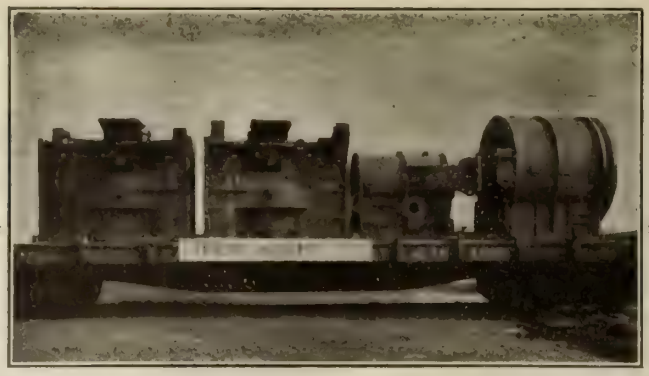
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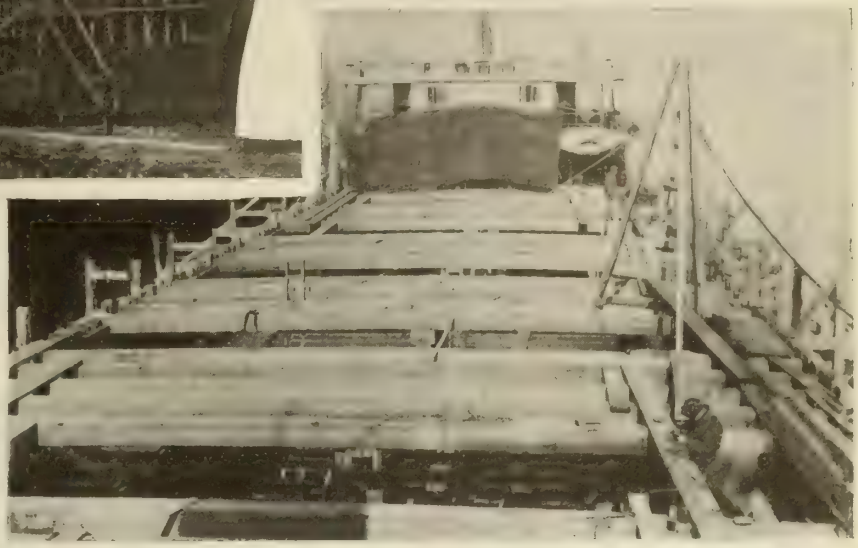
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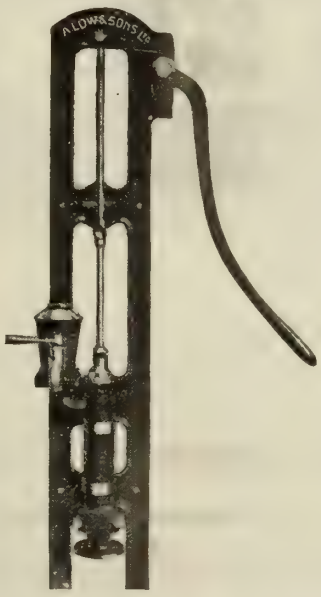
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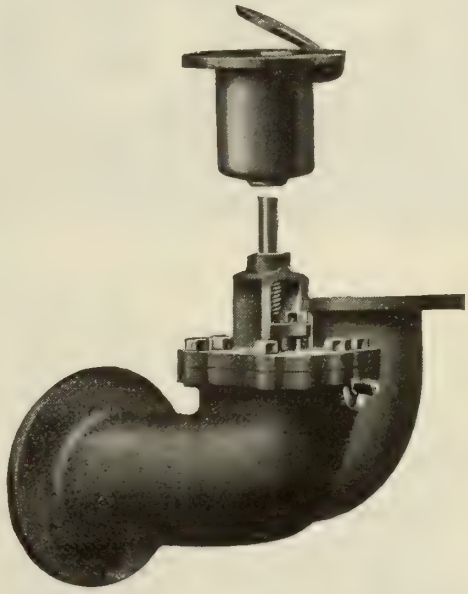
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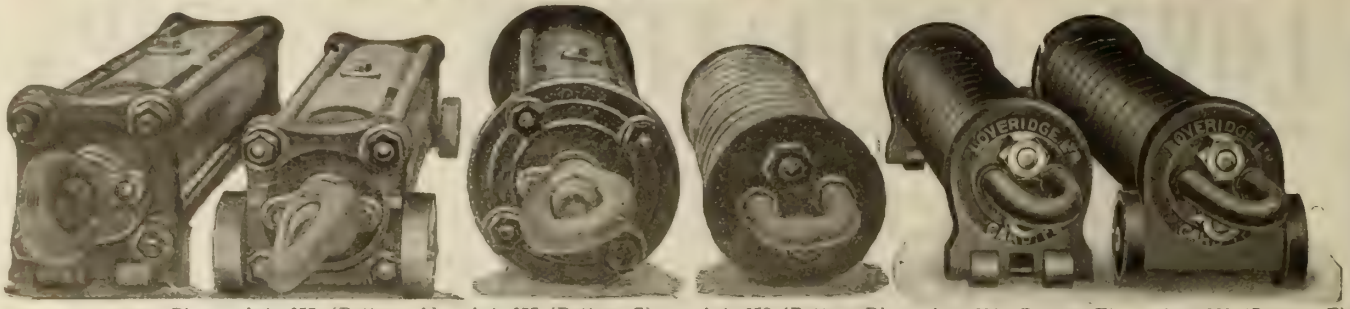
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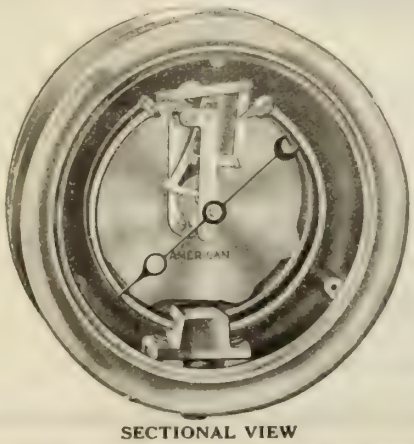
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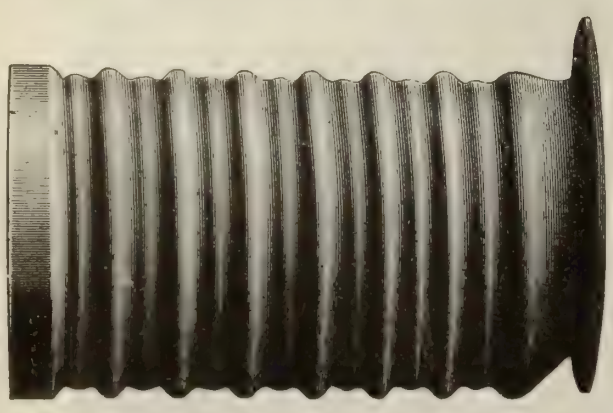
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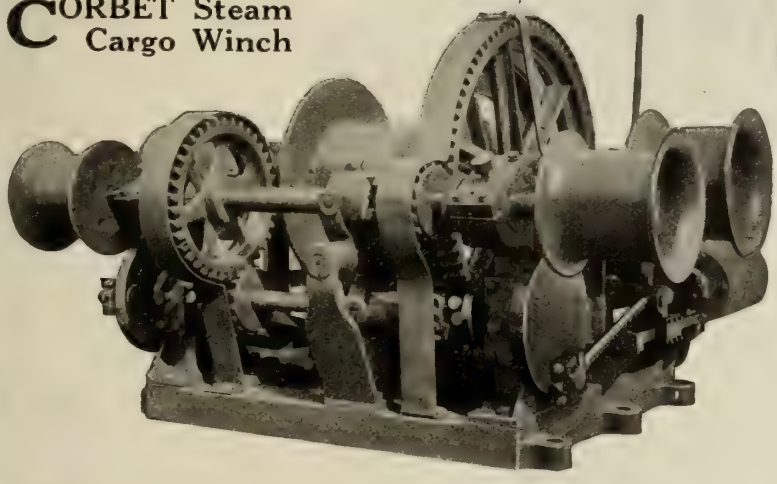
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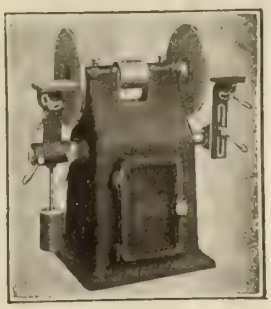
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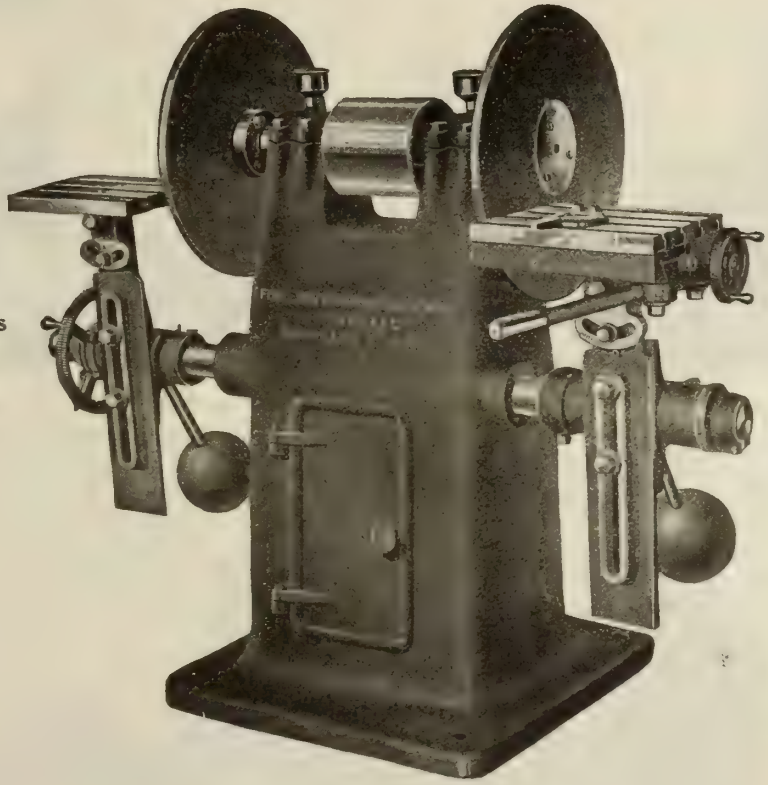


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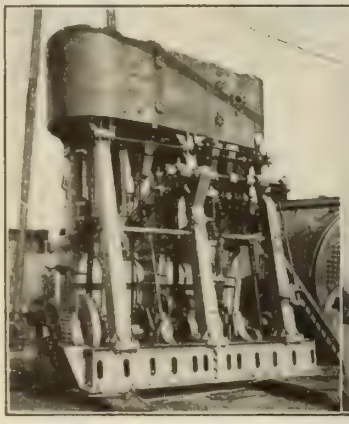
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Length Overall 385 ft.

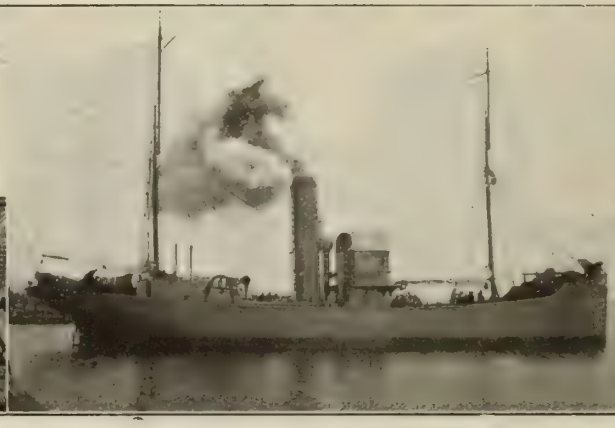
Breadth Moulded 52 ft.

Depth Moulded 28 ft. 9 in.

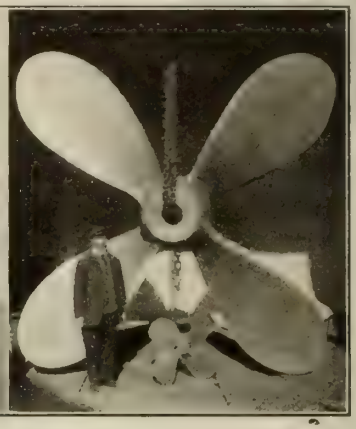
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Volume IX. TORONTO, JUNE, 1919 Number 6

Recent Additions to the British Royal Navy

Sir E. Tennyson D'Eyncourt's Paper Read Before the Institution of Naval Architects—New Methods of Protection From Torpedo Attack—Various Types of Ships Developed

THE next class were the "D's," the general arrangement and protection of which followed that of the Ceres, except that six 6-in. guns were carried on the centre line instead of five. The power was only slightly increased in these ships over the previous classes, but the revolutions were reduced to 275, all these later classes having the twinscrew geared arrangement, and although the displacement of the "D's" increased to 4,650 tons, the additional length and the reduction of revolutions enabled the speed of close upon 30 knots of the whole class of light cruisers, "C's" and "D's," to be practically maintained. The Arethusas and the "C" and "D" classes all had oil fuel only.

In addition to these light cruisers, which were all to Admiralty design, two vessels—the Birkenhead and Chester—which were built at Messrs. Cammell Laird's for the Greek Government, were purchased in 1915. These vessels were considerably heavier than the "C" class and more closely resembled the British "Chatham" class. They carried an armament of ten 5½-in. guns. The machinery was modified to burn oil only in the Chester, instead of coal and oil as in the Birkenhead, and the resulting increase in power to 31,000 gave the former a speed of 26½ knots.

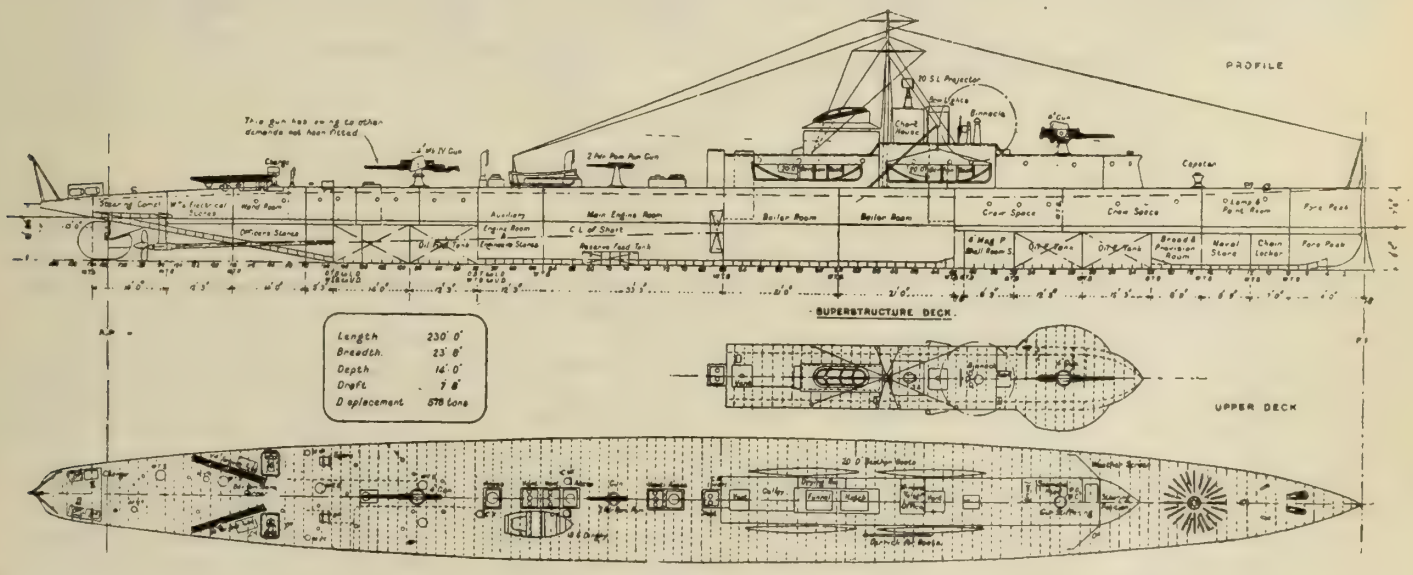
The "Raleigh" Class.—In the summer of 1915 designs were prepared for a considerably heavier class of light cruisers, more especially designed for ocean work in any part of the world. They were to have a speed of 30 knots and a large radius of action. Various armaments were considered, and it was finally decided to adopt an armament of seven 7.5-in. guns with twelve 3-in.—four being on high-angle mountings. Five of the big guns were placed on the centre line and the other two were on the broadsides amidships. The bow and stern guns were superposed, thus giving a fire of four guns, both ahead and astern, and six guns on either broadside. The conditions laid down involved a ship of great length, and these vessels consequently have an over-all length of 605 ft. These ships were originally designed to burn oil and coal, but this was subsequently altered in three ships of the class to all oil, the original power of 60,000 S.H.P. on the four-shaft geared turbine arrangement being considerably increased up to about 70,000 S.H.P. by the change to all-oil firing.

These vessels also differed from the light cruisers referred to above in having modified bulges as protection against under-water attack. The form of the section shows how these were arranged. The protective plating was similar to that of the other light cruisers.

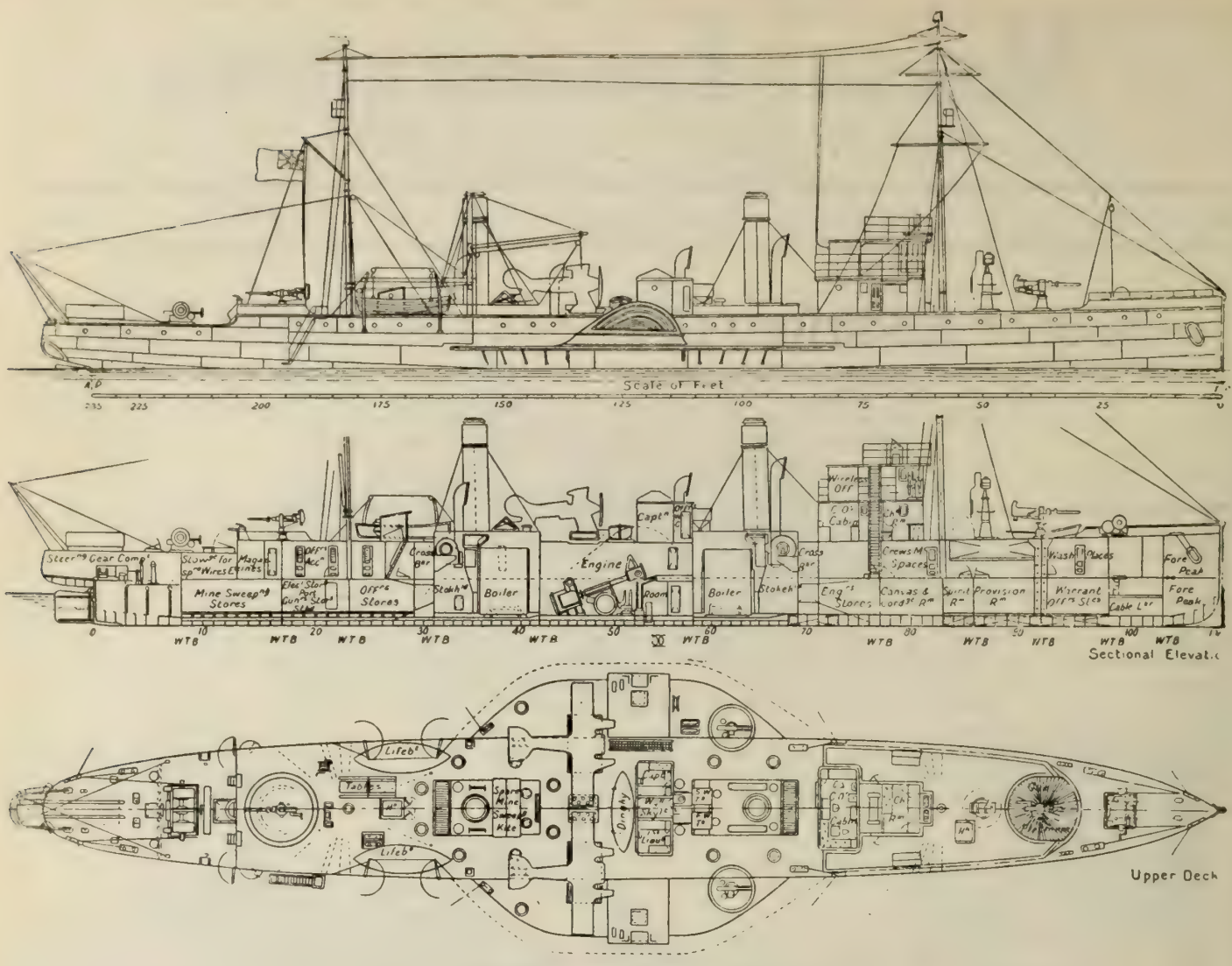
Monitors

The first vessels of this type to be added—or reintroduced—to the British Navy were the three ex-Brazilian river monitors built by Messrs. Vickers, Ltd., and taken over by the British Government in August, 1914, and renamed Humber, Mersey, and Severn. The particulars of these vessels are given in the table, from which it will be seen that the armament consisted of medium calibre guns, viz., 6 in. and 4.7 in. These vessels, though lightly built, have done very good service in the war, both on the East African and Belgian coasts.

The need for vessels of the monitor type mounting heavy guns soon became apparent, and I received instructions in November, 1914, to prepare designs of



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monitors of more substantial structure for sea-going service, but of light draught with good protection and carrying some heavy guns, the light draught combining the advantages of being able to go close inshore and greatly reduce risk of being struck by a torpedo.

The earliest design was that of the 14-in. gun monitors, four in number, which was commenced in 1914. Four twin-mounted 14-in. guns and mountings were available, and with the very simple form of structure adopted these vessels were designed and built in six months. They were quickly followed by the 12-in. monitors, which were of similar design but carried pairs of 12-in. guns, generally taken from older battleships. These vessels were also built in about six months. They all had a complete bulge of a form which was of simple construction, with an air space outboard and a water space between that and the ship proper. This bulge was carried well fore and aft, and the ships being of rather bluff form, the speed was somewhat below that estimated; the bluff form of the bulge having a bad effect upon the propeller performance. However, no particular point had been made about the speed, and we had rather to take what machinery we could get in the shortest possible time.

Following on the 12-in. monitors, early in June, 1915, two more vessels were ordered, mounting a pair of 15-in. guns. For these ships internal combustion engines, which were well under way, but designed for another purpose, were installed.

In September, 1915, two improved 15-in. monitors were ordered and named the Erebus and Terror. These were of finer form, of more power and greatly increased speed. These vessels also had an improved form of bulge, though it did not differ essentially from the bulges of the earlier monitors. The Erebus and Terror were designed to have a speed of 12 knots when fully laden, but they actually are capable of about 14 knots.

Following the earlier 15-in. monitors, some much smaller vessels, each carrying a 9.2-in. gun, were designed, and others again which carried 6-in. guns. I need not refer at any length to these, as the general particulars are given in the table. A good many of both large and small monitors went out to the Dardanelles in the early part of the war and did very good work, and for a long time they seemed to bear a charmed life, as they enjoyed complete immunity from torpedo attack. Whether this was due to their shallow draught or to the enemy submarines thinking it was useless to torpedo the bulges, I do not know. Later, however, the Erebus and Terror were both torpedoed; the latter received three torpedoes forward but got to port all right, though severely damaged, two of the torpedoes hitting forward of the bulge; the third, which hit the bulge itself, did very little damage. The former ship was hit full amidships by a distance-controlled boat carrying a very heavy charge, but the bulge gave her complete protection and she was repaired in less than a fortnight.

It is interesting to note in this connection also that some of our old cruisers of the "Edgar" class, which had had bulges added to them very early in the war, were torpedoed in the Mediterranean, but the bulge gave complete protection to the ship proper. They were taken to port and repaired.

Of the heavier monitors it may be remarked that of all ships carrying heavy guns these vessels were probably more often in action off the Belgian coast and elsewhere than any of our heavy-gun ships, and they no doubt gave the enemy

TABLE I.

	Battleships.						Battle cruisers.		Large light cruisers.	
	Iron Duke.	Queen Elizabeth.	Royal Sovereign.	Agincourt.	Erin.	Canada.	Tiger.	Renown.	Courageous	Furious.
Length between perpendiculars	580ft.	600ft.	580ft.	632ft	525ft.	625ft.	660ft.	750ft.	735ft	750ft.
Length overall	622ft. 9in.	643ft. 9in.	624ft. 3in.	671ft. 6in.	559ft. 6in.	661ft.	704ft.	794ft.	786ft. 3in.	786ft. 6in.
Breadth, extreme	90ft.	90ft. 6in.	88ft. 6in.	89ft.	91ft. 7in.	92ft.	90ft. 6in.	90ft.	81ft.	88ft
Load draught, mean	28ft.	28ft. 9in.	28ft. 6in.	27ft.	28ft. 6in.	28ft. 6in.	28ft. 6in.	25ft. 6in.	22ft. 3in.	21ft 6in.
Displacement in tons	25,000	27,500	25,750	27,500	23,000	28,000	28,500	26,500	18,600	19,100
Shaft horse-power of engines	29,000	75,000	40,000	34,000	26,500	37,000	108,000	112,000	90,000	90,000
Speed at load draught, knots	21	25	23	22	21	22½	30	32 (nearly)	32	31½
Fuel at load draught, tons	900	650	900	1500	900	1150	900	1000	750	750
Coal capacity, tons	3250	—	—	3200	2120	3300	3320	—	—	—
Oil fuel capacity, tons	1050	3400	3400	620	710	520	3480	4250	3250	3400
Armament	10 13.5in. 12 6in. 4 2lin. T.T.	8 15in. 12 6in. 4 2lin. T.T.	8 15in. 12 6in. 4 2lin. T.T.	14 12in. 20 6in. 2 2lin. T.T.	10 13.5in. 16 6in. 4 2lin. T.T.	10 14in. 14 6in. 4 2lin. T.T.	8 13.5in. 12 6in. 4 2lin. T.T.	6 15in. 17 4in. 2 2lin. T.T.	4 15in. 18 4in. 14 2lin. T.T.	- 10 5.5in. 18 2lin. T.T.
Armour—										
Side, amidships	12in., 9in., 8in.	13in., 6in.	13in., 6in.	9in., 6in.	12in., 9in., 8in.	9in., 7in., 4½in.	9in., 6in., 5in.	6in., 1½in.	3in.	3in.
Side, forward and aft	6in., 4in.	6in., 4in.	6in., 4in.	6in., 4in.	6in., 4in.	6in., 4in.	4in.	4in., 3in.	2in. forward	2in. forward
Bulkheads, forward and aft	8in., 6in., 4in.	6in., 4in.	6in., 4in.	6in., 3in.	8in., 5in., 4in.	4½in., 4in.	4in., 2in.	4in., 3in.	3in., 2in.	3in., 2in.
Barbettes	10in. to 3in.	10in. to 4in.	10in. to 4in.	9in. to 3in.	10in. to 3in.	10in. to 4in.	9in. to 3in.	7in. to 4in.	7in. to 3in.	7in. to 3in.
Gun-houses	11in.	11in.	11in.	12in., 8in.	11in.	10in.	9in.	11in. to 7in.	9in., 7in.	7in.
Conning tower	11in.	11in.	11in., 6in.	12in.	12in.	11in.	10in.	10in.	10in.	10in.
Protection—										
Vertical plating	1½in., 1in.	2in., 1in.	1½in., 1in.	1½in., 1in.	1½in.	2in., 1½in.	2½in., 1½in., 1in.	1½in.	1½in., 1in.	1in.
Forecastle deck	1in. amidships	1in.	1in.	1½in. amidships	1½in. amidships	1in. amidships	1½in., 1in.	1½in., 1½in.	1in.	1in.
Upper	2in. to 1½in.	2in. to 1½in.	1½in. to 1½in.	1½in.	1½in.	1½in.	1½in., 1in.	½in.	1in.	1in.
Main	1½in. at ends	1½in. at ends	2in., 1½in., 1in.	1½in., 1in. at ends	1½in.	1½in. aft	1in. at ends	3in. to 1in.	1½in., ½in.	1½in., ½in.
Middle	2½in., 1in.	1in. amidships	2in. slope main to middle	14in., 1in.	3in., 1in.	1in.		—		—
Lower	2½in., 1in	3in., 1in.	1in., 2½in., 3in., 4in.	2½in., 1in.	—	4in., 2in.	3in., 1in.	2½in.	3in., 1in.	3in., 1in.

TABLE I. (*continued*).

	Light cruisers.				Monitors						
	Arethusa.	Calliope.	"D" Class.	Raleigh.	Humber.	14in. Gun Class.	12in. Gun Class.	Marshal Soult.	Erebus.	9.2in. Gun Class.	6in. Gun Class.
Length between perpendiculars	410ft.	420ft.	445ft.	565ft.	261ft. 6in.	320ft.	320ft.	340ft.	380ft.	170ft.	170ft.
Length overall	436ft.	446ft.	471ft.	605ft.	266ft. 9in.	334ft. 6in.	335ft 6in.	355ft. 8in.	405ft.	177ft.	177ft.
Breadth, extreme	39ft.	41ft. 6in.	46ft.	65ft.	49ft.	90ft.	87ft.	90ft. 3in.	88ft.	31ft.	31ft.
Load draught, mean	13ft. 6in.	13ft. 6in.	14ft. 3in.	17ft. 3in.	4ft. 9in.	10ft.	10ft.	10ft. 3in.	11ft.	6ft.	4ft.
Displacement in tons	3500	3750	4650	9750	1260	6150	5900	6670	8000	540	355
Shaft horse-power of engines	40,000	40,000	40,000	60,000	1450	2000	2300 to 2500	1500	6000	480 to 800	400
Speed at load draught, knots	29	29	29	30	12	6 to 7	6 to 7	6 to 7	12	12 to 13	10
Fuel at load draught, tons	260	300	300	1000	50	200	200	100	220	—	—
Coal capacity, tons	—	—	—	800	187	400	350	—	—	—	—
Oil fuel capacity, tons	810	920	1050	1600	90	—	—	235	750	30	45
Armament	2 6in. 7 4in. (1 H.A.) 8 2lin. T.T.	2 6in. 8 4in. 4 2lin. T.T.	6 6in. 2 3in. H.A. 12 2lin. T.T.	7 7.5in. 12 3in. (4 H.A.) 6 2lin. T.T.	3 6in. 2 4.7in. howitzers —	2 14in. 1 6in —	2 12in. 1 to 4 6in. —	2 15in. 8 4in. —	2 15in. 8 4in. —	1 9.2in. 1 3in. —	2 6in. 1 6-pounder —
Armour—											
Side, amidships	3in.	3in.	3in.	3in., 2in.	—	—	—	—	—	—	—
Side, forward and aft	2in., 1½in.	2in., 1½in.	2in., 1½in. 1½in.	2½in., 1½in.	—	—	—	—	—	—	—
Bulkheads, forward and aft	—	—	1in. aft	1in. aft	—	4in.	6in.	4in.	4in.	—	—
Barbettes	—	—	—	—	—	8 in. to 2in.	8in. to 2in.	8in.	8in.	—	—
Gun-houses	—	—	—	—	—	10in., 7in., 4in.	10½in., 5½in., 4in., 2in.	13in., 11in. 4½in.	13in., 11in. 4½in.	—	—
Conning tower	6in.	6in.	—	9in.	—	6in.	6in.	6in.	6in.	—	—
Protection—											
Vertical plating	—	—	—	—	—	1½in.	1in.	1in.	1in.	—	—
Forecastle deck	—	—	—	—	—	1in.	1in.	1in.	1in.	—	—
Upper	1in. amidships	1in. amidships	1in. amidships	1in. amidships	—	2in. to 4in. on slope	2in. to 6in. on slope	1½in., 2in. to 4in. on slope	2in. to 4in. on slope	—	—
Main	—	—	—	—	—	1½in., 1in.	1½in., 1in.	1½in., 1in.	1½in., 1in.	—	—
Lower	1in. aft	1in. aft	1in. aft	1in. aft	—	—	—	—	—	—	—

TABLE I. (*continued*).

	Torpedo-boat destroyers.			T.B.D. flotilla leaders.		Patrol boats.	Sloops and mine-sweepers.			"China" gunboats.	
	"M" Class.	"R" and "S" Classes.	"V" and "W" Classes.	Kempenfelt Class.	Scott Class and Shakespeare Class.*	"P" Class.	Single-screw sloops. "Flower" Class.	Paddle mine-sweepers.	Twin-screw mine-sweepers.	"Fly" Class.	"Insect" Class.
Length between perpendiculars	265ft.	267ft.	300ft.	315ft.	320ft.	230ft.	255ft. 3in.	235ft.	220ft.	120ft.	230ft.
Length overall	273ft. 1in.	276ft.	312ft.	325ft.	332ft. 6in.	244ft. 6in.	267ft. 9in.	245ft. 9in.	231ft.	126ft.	237ft. 6in.
Breadth, extreme	26ft. 8in.	26ft. 8in.	29ft. 6in.	31ft. 9in.	31ft. 9in.	23ft. 9in.	33ft. 6in.	29ft. (58ft. over paddles)	28ft.	20ft.	36ft.
Load draught, mean	8ft. 8in.	9ft.	9ft.	10ft.	10ft. 6in.	7ft. 7in.	11ft.	6ft. 9in.	7ft.	2ft.	4ft.
Displacement in tons	1025	1065	1300	1650	1800	573	1250	810	750	98	645
Shaft horse-power of engines	25,000	27,000	27,000	36,000	40,000 to 44,000	4000	2400	1400	1800	175	2000
Speed at load draught, knots	34	36	34	34	36	22	17	15	16	10	14
Fuel at load draught, tons	140	150	195	255	250	50	130	—	—	—	—
Coal capacity, tons	—	—	—	—	—	—	260	150	140	5	35
Oil fuel capacity tons	230	300	370	515	500	93	—	—	—	10	54
Armament	3 4in. 1 2-pounder 4 2lin. T.T.	3 4in. 1 2-pounder 4 2lin. T.T.	4 4in. or 4.7in. 1 3in. 4 or 6 2lin. T.T.	4 4in. 2 2-pounders 4 2lin. T.T.	5 4.7in. 1 3in. H.A. 6 2lin. T.T.	1 4in. 1 2-pounder 2 14in. T.T.	2 4in. or 4.7in. 2 3-pounders —	1 3in. 1 6-pounder, 2 2-pounders —	1 3in. 1 6-pounder, 2 2-pounders —	1 4in. 1 3in. 1 6-pounder —	2 6in. 2 3in —

* Approximately same

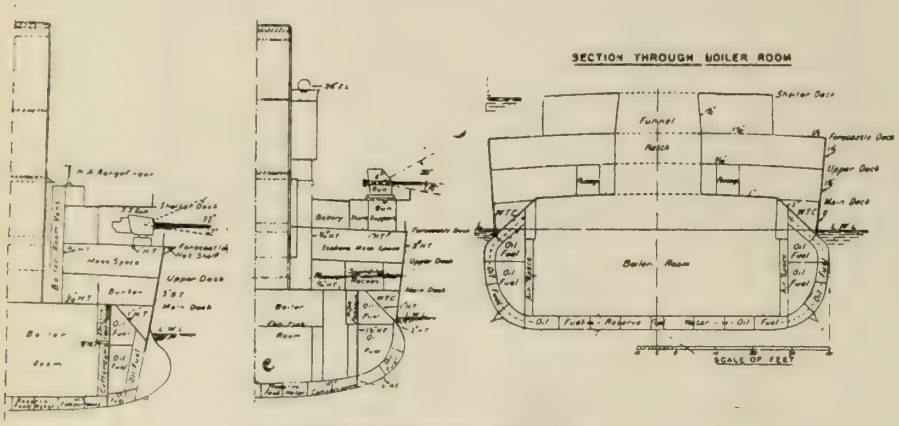
TABLE I. (*continued*).

	Submarines.					
	"E" Class.	"G" Class.	"H" Class.	"J" Class.	"K" Class.	"L" Class
Length between perpendiculars	180ft.	185ft.	164ft. 6in.	270ft.	334ft.	322ft
Length overall	181ft.	187ft.	171ft.	275ft.	338ft.	331ft
Breadth, extreme	22ft. 6in.	22ft. 6in.	15ft. 9in.	23ft.	26ft. 6in.	24ft. 6in
Load draught, mean	12ft. 6in.	13ft. 3in.	11ft. 3in.	14ft.	16ft.	13ft. 6in.
Displacement in tons, surface	660	700	440	1210	1880	890
Displacement in tons, submerged	800	975	500	1820	2650	1070
Shaft horse-power of engines, surface	1600	1600	480	3600	10,000	2400
Shaft horse-power of engines, submerged	840	840	320	1350	1400	1600
Speed at load draught, knots, surface	15	14	13	19	24	17½
Speed at load draught, knots, submerged	10	10	10½	9½	9	10½
Oil fuel capacity, tons	45	44	36	91	200	76
Armament	1 3in. 5 18in. T.T.	1 3in. 4 18in., 1 21in. T.T.	— 4 21in. T.T.	1 3in. or 4in. 6 18in. T.T.	1 4in., 1 3in. H.A. 8 18in. T.T.	1 3in. or 4in. 6 18in T.T.

in occupation of that coast a very anxious time.

Destroyers and Flotilla Leaders

To give a complete account of the development of the design and construction of our destroyers and flotilla leaders during the war would mean a very long paper, and I think, therefore, I must refer only to the tables and plans which I give. These vessels have gradually increased in size and power, and war requirements have continually added to the weights which they have had to carry, including considerably more fuel, heavier armament, both of guns and torpedoes, depth charges, larger bridges, and other additions. In fact, some of the ships which before the war were 900-ton vessels now carry an additional 100 tons, which, of course, is a very heavy handicap to these vessels when expected to maintain a high speed. The introduction, however, of the geared turbine has added enormously to the efficiency of the machinery and propellers; the lower revolutions which can



CROSS SECTION SHOWING BULGES.

be introduced with the gearing enabling us to adopt much more suitable propellers, in addition to giving a greater economy of fuel.

During the war nearly 300 torpedo-boat destroyers and flotilla leaders, which are simply a larger form of torpedo-boat destroyers, with improved accommodation, have been added to the Fleet, and the whole class of these vessels has been called upon to do continuous work in heavy weather. They have come through the ordeal with extraordinarily few breakdowns of machinery or other parts of the ship, whilst the duties they have been called upon to perform in combating the submarines, convoying, etc., have been most continuous and varied.

Most of the designs have been got out at the Admiralty, but certain others, including some torpedo-boat destroyers built for foreign countries and taken over by Admiralty have been evolved by the builders, Messrs. Thornycroft, Yarrow, White, Fairfield, J. Brown, and Hawthorn Leslie. Numbers of these vessels also have been built by firms which had never built a warship before, but the work turned out by them has fully met the Admiralty requirements.

The flotilla leaders, with a deep load displacement of about 2,000 tons and an armament of five 4-in. or 4.7-in. guns, and with their very high speed, might well be described as fast scouts or third-class cruisers.

Patrol Boats

Patrol boats naturally follow the torpedo-boat destroyers, as they were specially designed to relieve the torpedo-boat destroyers of some of their strenuous duties of patrolling and submarine hunting and escort work. The conditions were that they had to be as small as possible, consistent with keeping the sea in all weathers. They had to be fast enough to run down submarines, and they had to have shallow draught and all top hamper kept low to prevent their being seen at a distance. Economy of fuel was also an important feature, and it was desirable to have them built of mild steel rather than high tensile steel, to avoid drilling and special workmanship. They were provided with a special hard steel ram, with which a considerable number of enemy submarines were sunk without damaging the patrol boat. The various features were combined in a vessel of something under 600 tons, with geared turbine engines of 3,800 horse-power, giving a speed of over 22 knots, with 330 revolutions of the propellers. The boats had large rudder area and were cut up aft, so that they could turn very quickly upon the enemy—a most important feature for ramming purposes. They proved very valuable boats on service and did a great deal of work against the submarines in all weathers. They were armed with only one 4-in. gun, mounted in a commanding position in the forward superstructure, one 2-pounder and two 14-in. torpedo tubes, and later it was arranged to carry depth charges. Their cost was, of course, considerably less than that of a modern destroyer. Some of these boats were afterwards disguised to look like small mercantile craft—a device which also proved quite successful.

Sloops and Mine Sweepers

On the outbreak of war it became clear that there would be a great demand for mine-sweeping vessels. A good many coasting and cross-Channel steamers were taken up for this purpose, but more were required, and it was decided in December, 1914, to build twelve single-screw ships of simple design to this end. With a view of hastening construction it was decided to adopt mercantile practice as far as possible in both hull and machinery. The vessels, although of very fine form, were built of simple construction and under Lloyd's Survey. The boilers were of ordinary Scotch type and single-screw machinery was provided.

"CANADIAN SAILOR" LAUNCHED

The steamer "Canadian Sailor," a 3,400 dw. ton steel ocean freighter, was launched at the plant of the Port Arthur Shipbuilding Company, Ltd., on May 31, 1919, at 12.15 p.m. She is one of the Canadian Merchant Marine Fleet now building in Canada for the Department of Marine, and is the second boat for this fleet launched by the Port Arthur Shipbuilding Company. The company is building four 3,400-ton boats and two 4,300-ton boats for the Government.

Miss Emmeline Paige, daughter of Mr. J. F. Paige, general manager of the Port Arthur Shipbuilding Company, acted as sponsor for the "Canadian Sailor."

Following is a general description and principal dimensions of the "Canadian Sailor":

Steel screw single deck type with a straight stem and semi-elliptical stern built on the transverse system with poop bridge and forecastle.

Principal Dimensions

Length over-all, 260 feet; length between parallels, 251 feet; breadth molded, 40 ft. 6 ins.; depth molded, 23 feet.

Classification

The "Canadian Sailor" is built to British Lloyds, 100 A1 classification, fitted out in accordance with British Board of Trade rules.

Propelling Machinery

Placed amidships. Main engine, triple expansion, vertical inverted type, with cylinders 20½ in.-34 in.-56 in. by 40 in. stroke, developing about 1,500 i.h.p.

Auxiliary Machinery

To include a feed pump evaporator of 15 tons capacity per 24 hours, auxiliary condenser with attached air and circulating pumps, vertical duplex ballast pump and auxiliary feed pump. Steam ash hoist located in boiler room.

Boilers

Steam to be supplied by two Scotch boilers 15 ft. by 11 ft., construction according to Lloyds and Canadian rules, having working pressure of 190 lbs.

Port Arthur.—The two ships that are now building at the plant of the Port Arthur Shipbuilding Co. for the Canadian Government, will be named the "Canadian Cadet," and "Canadian Adventurer," respectively.

The Marine Air Pump as a Power Factor

The Author, in a Paper Read Before the Institute of Marine Engineers, Has Some Interesting Notes on Air Pump Efficiency, and Its Effect on Ship Performance

By HAROLD C. WALKER, M.I. Mar. E.

SOME time ago during a run round the coast it was noticed that the performance of the vessel was very sensitive to the vacua carried, and it was suggested by a brother member that a few descriptive notes on air pump efficiency would be of interest to the Institute. As a result of this suggestion a paper was drafted on these lines, illustrating as far as personal experience went several types of pumps as found in marine practice with particular reference to a recent type showing comparatively their respective possibilities of performance from a vacuum point of view.

The presenting of the paper, however, was delayed on account of the war, and in redrafting the notes it was felt they might be of more practical interest if broadened to include the value of air pump efficiency as an influence on turbine power. Unfortunately, circumstances have been against anything more than a sketch in this direction, but it is hoped the remarks will form a basis for discussion and further a subject that is perhaps not so well known as other branches of marine work.

As a unit in turbine power, the marine air pump is expected, in brief, to maintain the highest possible condenser vacua in withdrawing the air, vapor, and condensate or condensed water; as the air is withdrawn from the same space as the water, it follows as a natural law that the possibilities in vacua for any type of pump is limited by the condensate, that is the pump cannot produce a higher condenser vacuum than the vapor tension of the condensed water. (See table, Figure 1). An efficient pump from a vacua standpoint might be said to be one that could withdraw its quota of air, etc., and maintain this ultimate vacua.

In reviewing the possibilities of several types of pumps, the first taken, and probably the most familiar, is the wet pump with "head," "foot," and "bucket" valves, and drawing air and water through a common suction. Its chief recommendations are simplicity in connections and absence of auxiliary gear.

The theoretical vacuum this type of pump can produce under different air leakages may be expressed in curve form as in Figure 3. The extremes of this curve, which approximate a straight line, would be zero air leakage corresponding to vapor tension of water, and zero vacuum at an air leakage equal to capacity of pump, say, in cubic feet per minute, a usual scale for expressing air leakage.

That this vacua is theoretical is evident by the pump's performance in service and from a study of Figure 4, it is suggested the principal drops are twofold:—

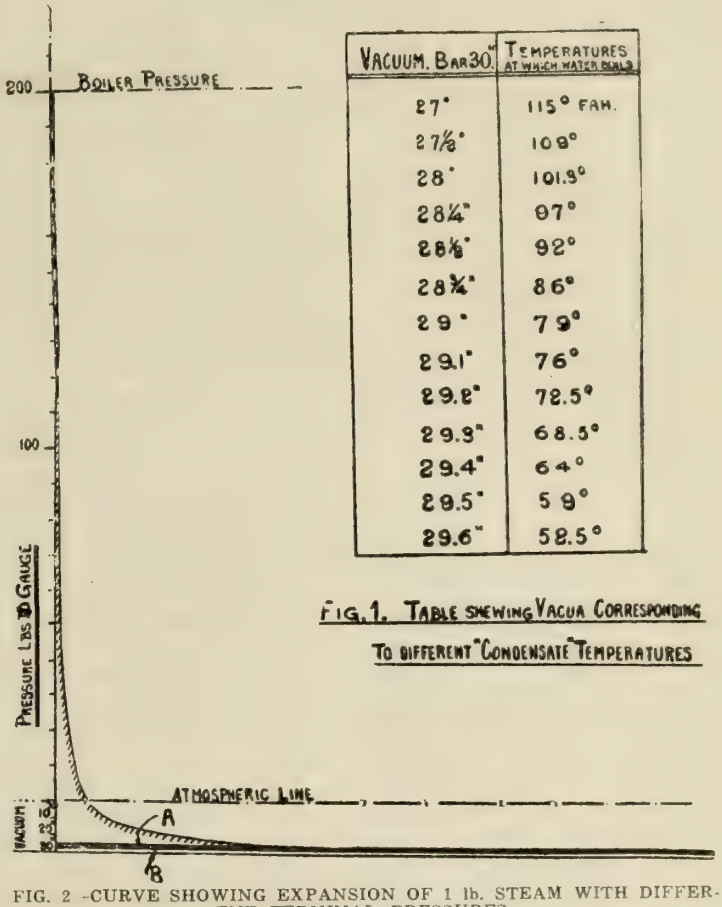
1. A static loss "H" due to head of water in pump base.

2. Frictional losses varying roughly as air leakage.

Curve "A" in Figure 5 represents previous theoretical curve on a larger scale and head loss (1) being calculable; this static loss can be allowed for by curve "B" lying parallel to curve "A" and lower by the amount calculated. To include the frictional loss (2) an approximate curve "C" might be drawn starting from same point as "B" (zero air leakage) and increasing its distance from "B" as air leakage increased. Curve "C" would then be the utmost one might expect as denoting the possibilities in vacua for this type of pump, and blank flange tests appear to confirm this. A characteristic test curve is given in dotted line. The vertical line "XX" in this and following curves is an approximation of the normal limit in air leakage under service conditions, from which it would appear a wet pump's performance is well below requirements even for theoretical condition of zero air leak.

The "Edwards" air pump is another well-known type, and represents an improvement on the wet pump, the "head" and "frictional" losses being practically eliminated. Its action, however, depending on a positive length of stroke, introduces mechanical disadvantages when arranged as a separate unit. Its performance curve follows closely curve "A" in Figure 5, and is still below requirements even for "bottle-tight" conditions.

Several makers have adopted another type of pump having a separate wet and dry barrel, in which the dry barrel is about thirty per cent. greater in capacity and retains in its system a constant amount of sealing water, which passes through the barrel and returns via a cooler to the dry suction again, at a temperature a few degrees above that of the sea. In addition to its increased capacity the single dry barrel offers a further capacity in the relatively smaller amount of water passing and higher possible speed, and its performance with-



VACUUM. BAR 30"	TEMPERATURES AT WHICH WATER BOILS
27"	115° FAH.
27½"	109°
28"	101.9°
28¼"	97°
28½"	92°
28¾"	86°
29"	79°
29.1"	76°
29.2"	72.5°
29.3"	68.5°
29.4"	64°
29.5"	59°
29.6"	52.5°

FIG. 1. TABLE SHEWING VACUA CORRESPONDING TO DIFFERENT CONDENSATE TEMPERATURES

FIG. 2 -CURVE SHOWING EXPANSION OF 1 lb. STEAM WITH DIFFERENT TERMINAL PRESSURES.

out the cooler would approximate the wet pump curve "C."

It has greater possibilities, however, in that the bucket can produce in the barrel a higher vacuum corresponding to the cooled sealing water temperature. Thus its apparent performance curve, instead of being "C" would be curve "D" and higher by the equivalent to the difference in temperatures between the sealing water and condensate. In other words, the new curve "D" would be "C" redrawn for a sealing water temperature instead of condensate. It is obvious that an increasing air leakage would tend to neutralize the cooling effect and curve "D" extended would not be parallel to "C," but tend to approach it, that is, show a lesser gain over wet pump performance as air leak increased. Further, the gain in vacua is directly dependent on the cooling range available, which in turn rests upon the difference in temperatures of sea and condensate. This latter difference under modern conditions limits the range of cooling to some ten to fifteen degrees, and with condensates of eighty degrees and under the gain in vacua due to cooling would be more than lost in the pump suction. The dotted line shows a typical test curve for blank flange conditions.

Figure 8 represents in crude diagram another system and one where the wet and dry barrels are identical. In series with the dry suction a steam ejector is introduced discharging through a small "DC." condenser or "receiver" served with condensing water from the air pump discharge. These auxiliary units are designated in the sketch by letter "A." The steam jet relieves the pump considerably, and the overall steam remains much the same as in previous types. Further, the jet when dealing with a relatively large amount of air, maintains on its suction side a vacuum approximating the vapor tension line irrespective of condensate temperatures. A performance curve for this system is

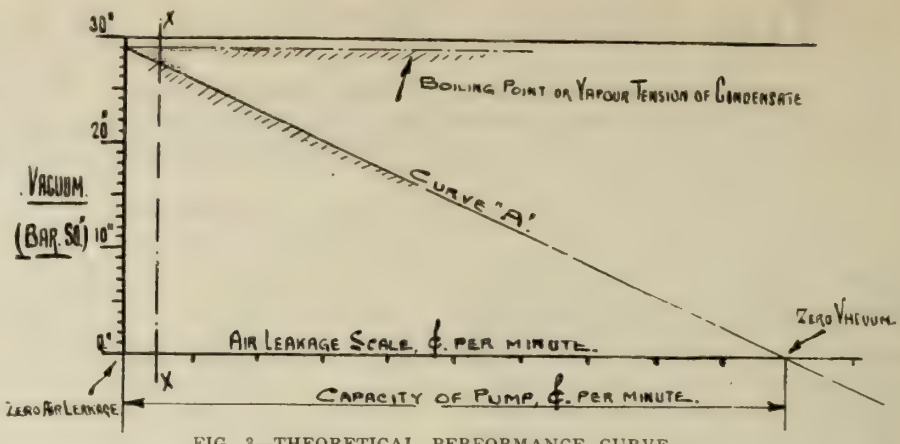


FIG. 3—THEORETICAL PERFORMANCE CURVE.

given in Figure 9, and would be much the same for a higher or lower condensate temperature, the curve covering the vapor tension line within normal leakage and falling away gradually as leakage increased. Where a small condensate head is available, both barrels can be arranged to take air, offering almost a double capacity and an extended performance curve as shown in dotted line in Figure 9. It also allows the use of a single barrel pump, the arrangement being shown in Figure 10A.

The system is given in diagrammatic detail in Figure 10, and excepting the small suction valve between head and bucket valves of dry barrel, the pump is identical with its twin wet prototype.

A further type working in conjunction with a steam jet is what might be termed a "Rotary" pump (Figure 11), in which the "receiver" and dry barrel is replaced by a water-operated air ejector served by a small high-speed centrifugal pump, whose circuit water is an accumulation of condensate in the "Kinetic" or ejector tank. The wet barrel portion is replaced by a centrifugal condensate pump discharging through the tank to feed pump or filters. The performance curve of this system is much the same as in the case of the steam jet reciprocating combination in Figure 9.

When turbine driven and exhaust used in feed heating, the slight disadvantage in steam consumption is immaterial, and the system as a whole would appear a progressive step in auxiliary practice in embodying the advantages of rotary motion. It has done good service afloat and is in extensive use in land practice.

The relative position of the line "XX" on a performance curve is a case of anticipating the normal limit in air leakage under service conditions. Air entering the system through the feed water may be approximated, but direct leakage through joints, glands, etc., is beyond calculation, and in turbine practice it is usual to adopt an allowance beyond the known to allow for the unknown. About ten times the entrained air is frequently adopted as a working limit in air leakage

cubic feet of free air per minute for each hundred thousand pounds of feed water per hour. In reasonably large plants this figure is comparatively easy to keep under. In small plants of say a thousand shaft horse-power and under, where a small leakage may easily in itself amount to the allowance, a larger margin is essential. The amount of drop at a normal leakage is a question of capacity and type of pump. The capacity would appear to influence the rate of fall or slope of curve; the type, from the cases just considered, the characteristic of the curve. Capacity is not only a matter of dimensions, but also pump speed. Where thirty double strokes per minute for continuous running might be regarded as a reasonable limit, and half this from a purely mechanical point of view, many cases have of necessity to work at a much higher speed. Rated at thirty double strokes per minute an average pump offers per air barrel a capacity of eight to ten times the volume of feed water. A twin wet system, with two barrels taking air, would therefore offer double this figure. It may be of interest to compare this to the direct driven pump of the reciprocating engine, which averages a capacity of fifty to eighty

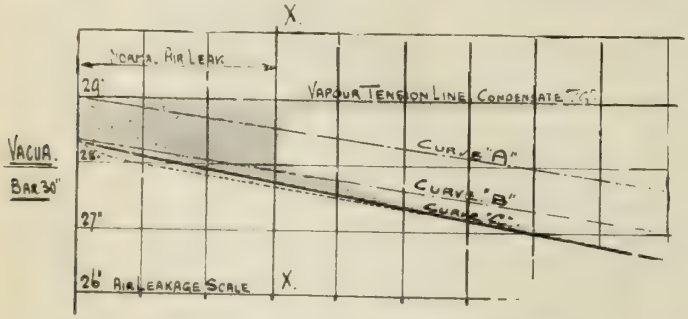


FIG. 4—COOLER PUMP CURVE CONDENSATE 97°.

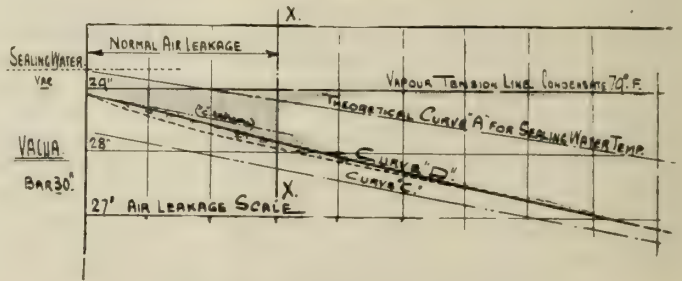


FIG. 5—TWIN WET PUMP CURVE CONDENSATE 79°.

times its feed water, giving a fine slope curve, and in an "Edwards" pump a fair performance for moderate vacua conditions.

Given type and capacity of pump the drop for a normal or exceptional leak might thus be more or less anticipated. Where type and capacity are under consideration it is suggested a pump's performance at, say, three times a normal air leakage relative to its influence on

main power is also worthy of consideration. A performance at this point corresponding to a negligible influence would not only offer a healthy margin for excess leakage, but in the case of twin screw vessels the practical advantage of one auxiliary working both sides, given suitable cross connections. An approximation of the requirements in air pump practice would thus appear to be:—

1. Ultimate vacua for normal air leakage;
2. Minimum speed for wear and tear;
3. Minimum vacua drop at treble normal air leakages;
4. Low steam consumption.

The performance curves of the several types considered would suggest marked differences in the possibilities of different air pumps in service, and further, that in many cases a decided drop exists within the limits of normal air leakage corresponding to an equivalent loss in condenser vacua or a very cold hotwell to support a moderate vacuum. This varying degree of drop or difference between

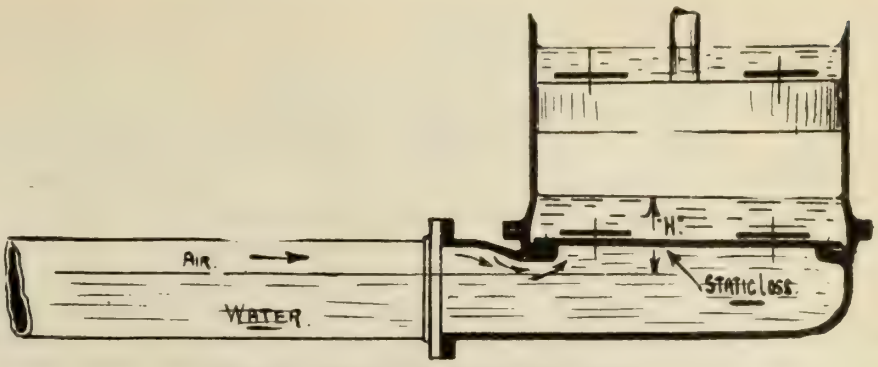


DIAGRAM SECTION THROUGH WET PUMP.

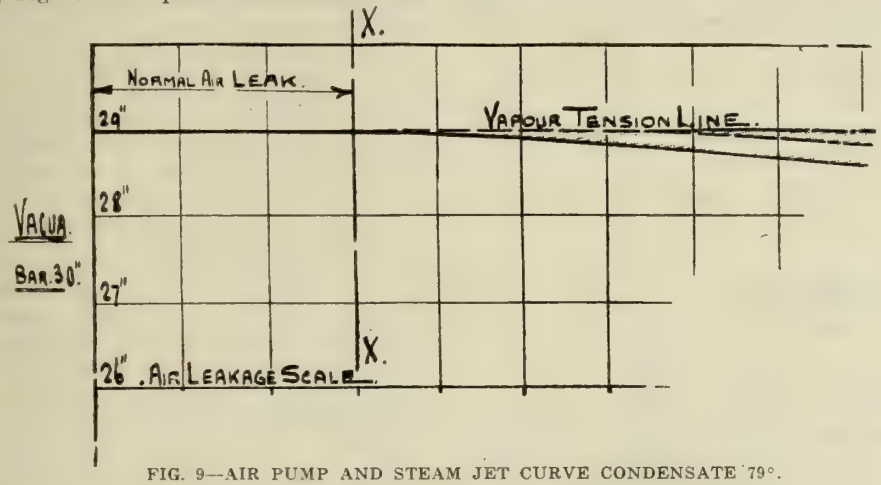


FIG. 9—AIR PUMP AND STEAM JET CURVE CONDENSATE 79°.

the possible and actual in vacua might be expressed as excess back pressure at turbine exhaust which naturally adversely influences the main power. As the measure of this influence is not easily identified it is probably very often overlooked or simply accepted as unavoidable.

It is suggested a rough measure of recording this influence would be to construct a vacua-revolution curve, and an example is given in Figure 12. Steam settings should remain unaltered on a steady course and revolution readings taken over periods of different vacua The curve plotted could be produced as an approximation for higher vacua and by comparing two points on the curve —the actual vacuum and that vacua equivalent to the condensate temperature —a fair measure of the effect of the "shortcomings" of the air pump system is ascertainable. As an illustration, the pump performance of Figure 5 might be applied to the curve giving the two points shown—an approximation of the actual and the desirable in vacua for a wet pump on a seventy-nine degree hotwell basis. As shown the loss in revolutions is about seven per cent., and the curve taken being by no means an optimistic example the loss would be higher in many cases. It is perhaps needless to add, the measure of the influence would be much more unfavorable with a heavier air leakage. It should be noted the points given represent vacua at the point of condenser. The residual drop through condenser, due to steam friction alone, might be taken as more or less constant for small changes. Actual eduction vacuas could, if desired, be represented by setting points a small distance down the curve equivalent to the steam drop through condenser.

A rough theoretical illustration of this influence is suggested by means of a diagram as in Figure 2, which indicates roughly to scale the theoretical expansion of a unit amount of steam in its passage through the turbine. The two base lines, representing the possible and actual in vacua, enclose an area which to the whole might be taken as an approximation of the percentage loss of main power in the eduction line of turbine. It will be seen the degree of loss for the same back pressure would tend to increase as the vacua increased, and up to a point this is the case in practice. Verbal note in increasing length of absixer increases area. Given efficient air pump conditions the question of condenser performance, as controlling condensate temperatures and the steam drop through the condenser, is a question of design and circumstances and where these conditions are favorable the loss through the condenser can be reduced to a minimum.

As controlling the condensate temperature, the condenser performance has a direct bearing on the air pump's possibilities, and as a passing reference on the overall performance it is suggested a modern unit should be capable, under normal sea temperatures of, say, fifty to seventy degrees, of maintaining an eduction line vacuum, expressed in degrees, equal to the sea temperature plus twenty-five, or:—

Eduction vacua = sea + 25° (Fah.)

(In degrees Fah.)

Excepting abnormal cases, a modern condensing plant that cannot give this vacua is probably registering an excess back pressure at turbine exhaust direct-

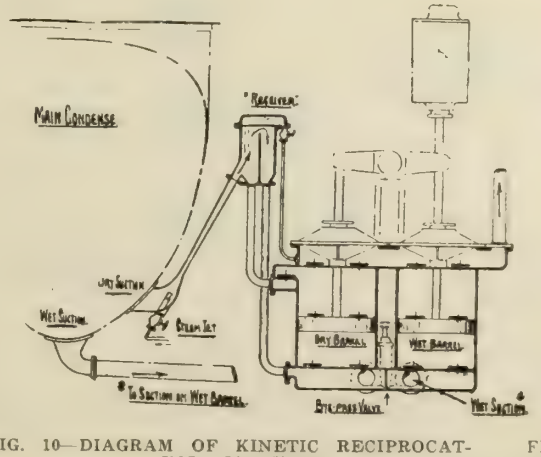


FIG. 10—DIAGRAM OF KINETIC RECIPROCATING AIR PUMP.

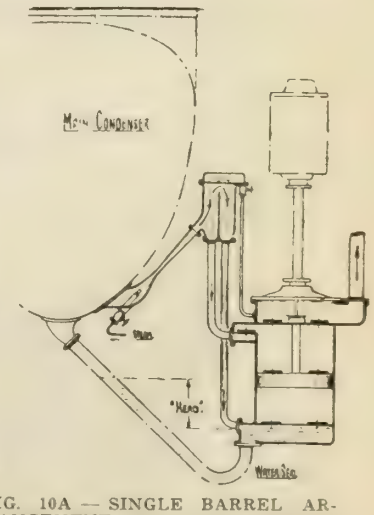


FIG. 10A — SINGLE BARREL ARRANGEMENT STEAM JET WHERE CONDENSATE HEAD IS AVAILABLE

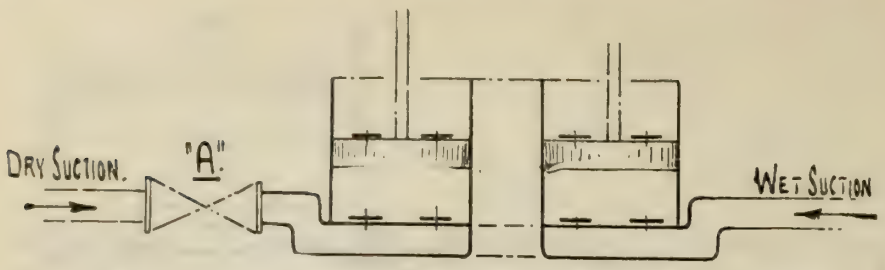


FIG. 8—CRUDE DIAGRAM OF STEAM JET RECIPROCATING AIR PUMP.

ly due to air pump inefficiency. It is desired to say all vacua spoken of are standard, that is vacuum readings corrected to a thirty-inch barometer. Temperatures are given in all cases as Fahrenheit.

It might be said with reference to these corrections that ascertaining the vacua in eduction line by gauge alone is open to question. Contemporary barometer readings are not always available, and in some cases the face readings are apt to be given without correction. Mercury gauges measuring from the absolute remove these objections, but in the higher vacua ranges a minute leakage in connections will give a misleading reading. Readings should not be accepted from this type of gauge when the mercury column "creeps" with cock shut off at condenser, as this denotes air leakage in the instrument or its connections and a higher absolute pressure than the actual. Under settled conditions a very fair reading of eduction line conditions can be obtained from the steam temperature, and it is suggested a thermometer pocket for this purpose should always be fitted in eduction line of turbine at condenser end and deep enough to escape errors due to heat lag in shell under changes on vacuum. It is not desired to condemn the usual types of gauges in use, but rather to point out how easily error can creep in, quite apart from the difficulty of checking a gauge if its accuracy is in doubt. The thermometer is suggested as a handy check, and when discrepancies arise it affords the opportunity of checking where the difference occurs before accepting either reading as final. In conclusion, while very much regretting it has not been possible to deal with the subject in more than an outlined form, it is hoped the notes as far as they go will be of practical interest and that they may form a basis for discussion on air pump efficiency, both as a practical and as a commercial proposition.

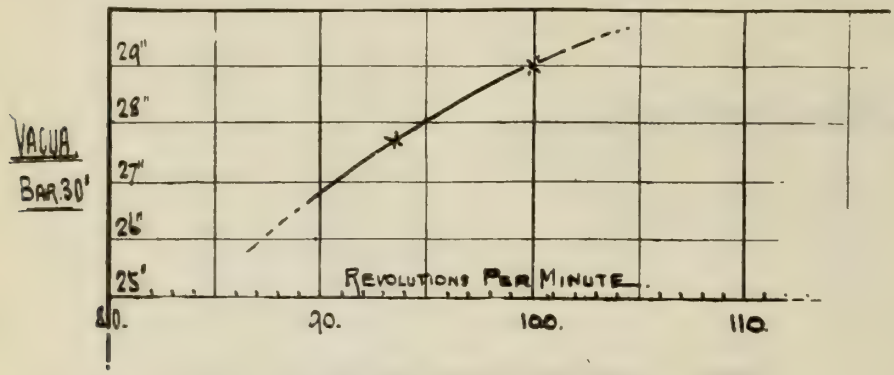


FIG. 12—VACUA REVOLUTION CURVE NORMAL POWER.

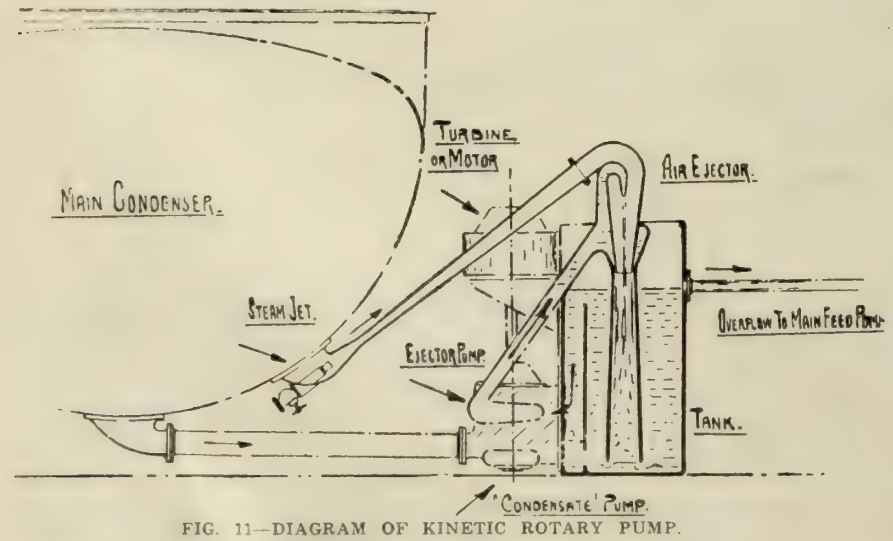


FIG. 11—DIAGRAM OF KINETIC ROTARY PUMP.

MAY COME TO CANADA

THE Swansea (Wales) correspondent of the "London Daily Telegraph," writes his paper as follows:

Mr. J. C. Davies, joint managing director of Baldwins Limited, has returned to Swansea after a three weeks' business visit to Canada. The visit has been connected with proposals to acquire British Forgings, the large Imperial Munitions Board plant in Toronto, and, though matters are yet in a preliminary stage, I understand that the proposals are being viewed with favor, and that developments may be expected in the near future. As a result of inquiries I have made to-day in Swansea, I am told nothing definite so far can be stated. I understand that any developments on the other side would be supplementary to their present works in this country.

The last occasion when an essentially Swansea firm in a similar way of business undertook branch interests across the Atlantic was when Mr. W. H. Edwards opened tinning and tinplate works in the United States. This was shortly after the passing of the McKinley tariff, a heavy impost being then placed on Welsh tinplates. Mr. Edwards sought to export blackplates to America, and to carry out the finishing and tinning process out there, and so escape the tariff. Congress, however, quickly amended the tariff to include blackplates. The Japanese were similarly foiled when a tariff was placed upon straw hats. They sought to import into America straw hats without hatbands, these coming under the heading of 'partly-manufactured goods.' As in the case of tinplates, the tariff was quickly amended to cover these imports.

The firm of Baldwins was formed seventeen years ago to amalgamate the large and old-established undertakings of Wright, Butler, & Co., Ltd., E. P. and W. Baldwin, Ltd., A. Baldwin & Co., Ltd., the Blackwall Galvanized Iron Co., Ltd., and the Bryn Navigation Colliery Ltd.

The employees of the company number 12,000, and the company own iron and steel works located at Swansea, Gowerton, Port Talbot, Newport, and Brymbo; the following sheet tinplate and galvanizing works: Panteg Sheet Works, Newport; Lower Mills Sheet Works, Pontypool; Phoenix Galvanizing Works, Pontypool; King's Dock Works, Swansea; Wilden Ironworks, Stourport; Stour Vale Works, Kidderminster; Cookley Works, Brierley Hill; Swindon Works, Dudley, and Blackwall Works, London. They have coke ovens at Landore, Cwmavon, and Port Talbot, collieries at Aberbaiden, Bryn, Cribwr Fawr, and Albion, the Cornelly Limestone Quarry, the Black Mountain Silica Quarry, and brick and silica works at Swansea.

Montreal.—The War Convoy, an 8,800 ton steamer, has been purchased by Seattle interests for $1,500,000. She will load on the Pacific coast for United Kingdom and continental ports. The deal was put through in New York.

The Contraflo System of Utilizing Exhaust

By Means of This Arrangement All the Heat of Exhaust Steam From Engine Room Auxiliaries is Made Available and Less of the Heat in Main Engine Exhaust is Rejected

THIS system of condensing, vacuum producing, filtering, and feed heating apparatus which was primarily developed by Mr. D. B. Morrison, of Messrs. Richardson, Westgarth & Co., Hartlepool, England, a number of years ago, and has since been extended and further improved by the Contraflo Condenser and Kinetic Air Pump Syndicate, London, England, is now being manufactured in Canada under license by the Goldie & McCulloch Co., Limited, Galt, Ont.

The objects of the Contraflo system are:—

To return to the boiler by means of the feed water the entire heat in the exhaust steam from the auxiliary engines, thereby economizing coal.

To realize this thermal gain in all seas by means of a "Contraflo" condenser, which continuously maintains the highest economical vacuum with the least pumping power.

To increase the propelling power of the main engines without increasing the coal bill.

It has been established that with the "Contraflo" system of vacuum producing a higher vacuum can be obtained with smaller cooling surface than with the ordinary surface condenser, thus leading to greater power being developed in the main engine. Also by means of the steam ejector (which is part of the "Contraflo" system and is described hereafter), this higher vacuum is produced not only without cooling down the condensate (boiler feed water), as would be the case with an ordinary condenser when endeavoring to obtain higher vacuum, but the condensate is delivered to the air pump at a higher temperature than usual, thus leading to economy in the boiler room.

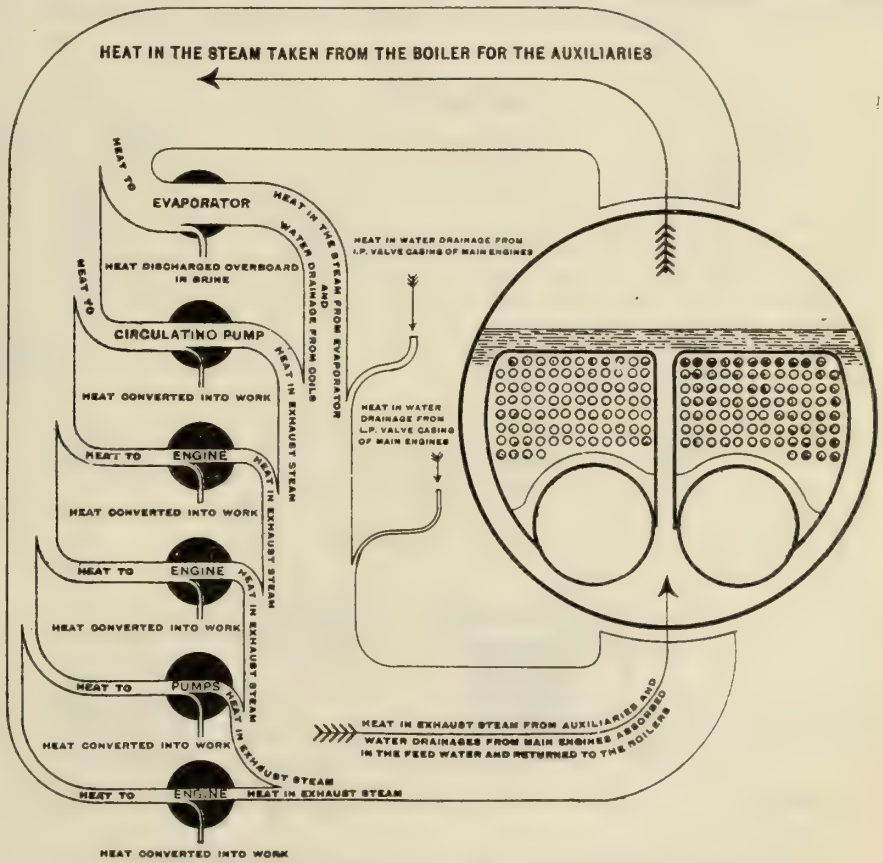
As regards the "Contraflo" system of auxiliary condensing and feed water heating and filtering apparatus, one of the principal features of this is the small size of the winch condenser required. The "Contraflo" winch condenser is usually fitted in connection with the "Contraflo" compensator heater and the "Contraflo" cascade feed water filtering, cleansing, and heating tank. The exhaust from the various auxiliaries is all utilized, partly in being condensed into boiler feed water and partly for the purpose of heating up the boiler feed water, but eventually ALL exhaust steam becomes boiler feed water and the system is so flexible that the temperature of feed can be regulated to almost any desired extent on either the suction or the delivery of the delivery side of the boiler feed pumps.

The "Contraflo" cascade filtering and heating tank receives the water discharged by the engine air pump, the drains from the I.P. and L.P. receivers, and all other drains from around the engine room and from the winch condenser and compensator heater; it also receives such exhaust steam as is not used in the compensator heater for heating feed water on its way to the boilers or which is not condensed in the winch condenser and returned from thence to the cascade tank as hot water. This steam can therefore be utilized for heating feed water on the "Cascade" tank on the suction side of the pumps. The tank is arranged with special heating nozzles and a system of filtering and baffling to separate oil and foul water from the cleansed and heated feed water.

The feed pumps, either engine driven or independently driven, receive this cleansed water and deliver it through the "Contraflo" compensator heater, where it is further heated by a portion of the exhaust from auxiliaries, as mentioned above. The portion of the exhaust steam not used in the heater will, as occasion arises, either pass partly to the winch condenser and thence back to the Cascade tank as hot water, or else go direct to the Cascade tank as already described; all these operations are practically automatically controlled once the regulating valves on the pipe lines are properly adjusted.

The "Contraflo" winch condenser is arranged with temperature control so that should the feed water coming from it to the Cascade tank and thence on to the suction side of the feed pumps, be too hot for the pumps to deal with it can be regulated to a temperature the pumps can handle and the greater portion of the feed heating then is done in the Contraflo compensator heater, placed on the discharge side of the pumps.

By utilizing portion of the exhaust steam to heat the feed water in the Cascade filter tank the compensator feed heater can be made much smaller than is usual in ordinary practice where the whole of the exhaust steam is passed through the heater; also an effective device is fitted for collecting and removing air both from the steam chamber and the water heads, this generally being overlooked in ordinary practice.



THE DISTRIBUTION OF HEAT IN EXHAUST SYSTEM

It will be seen from the foregoing that ALL the heat in the exhaust from the engine room and deck auxiliary machinery and all drain water from main engine and auxiliaries is utilized in heating the feed water, also that ALL the exhaust eventually becomes feed water.

Another feature of the "Contraflo"

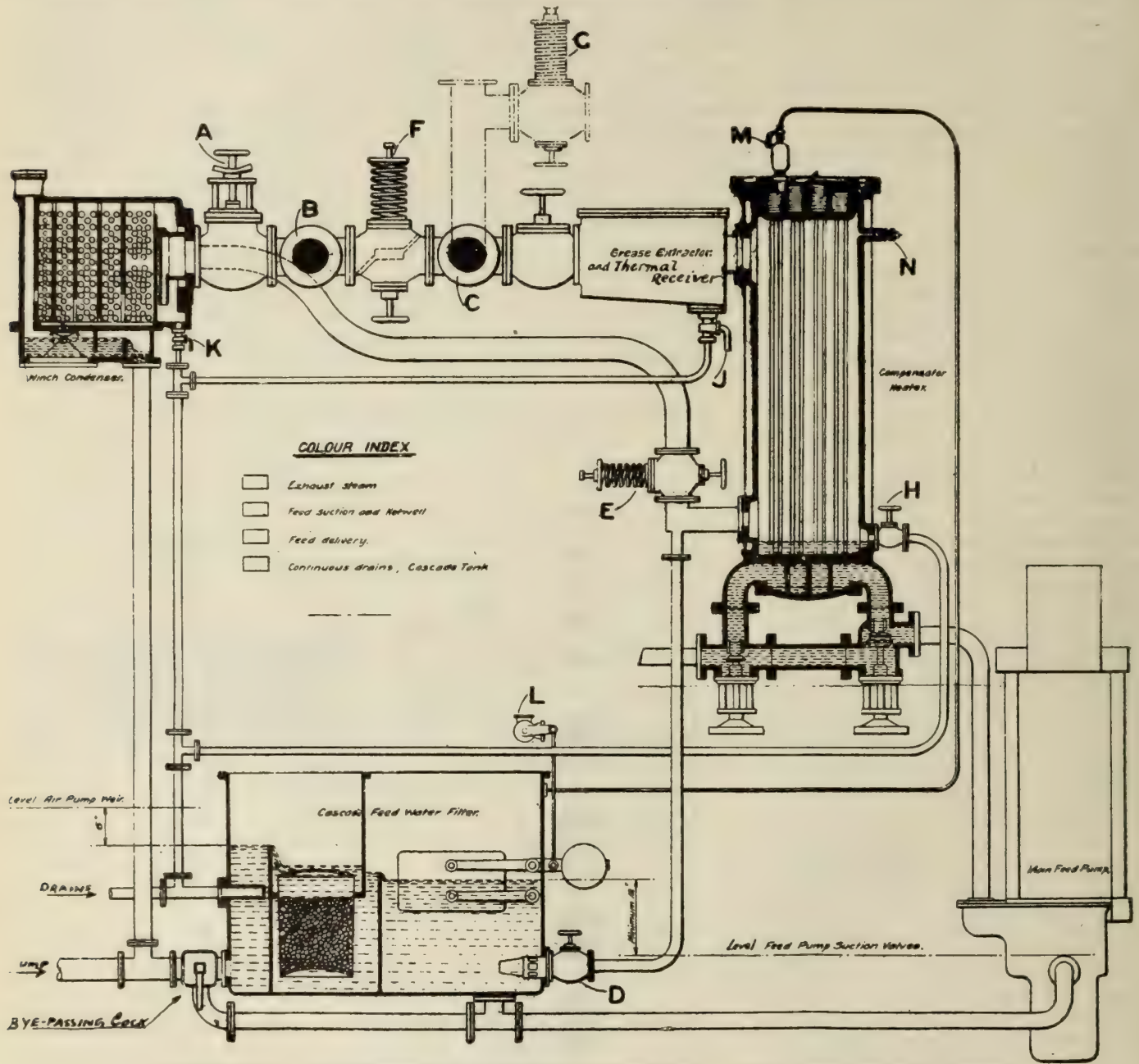
auxiliary system is the very complete method adopted of removing oil and grease from the exhaust steam and feed water, a special oil and grease separator being placed close to the compensator heater, and the winch condenser also having an oil extracting device; likewise the Cascade tank has an effective oil collecting and filtering medium and a system of baffling, all of which make for feed water very free from oil.

Regarding the main condensing system, the principal feature of this consists in combining a small auxiliary jet condenser or receiver tank in series with the main condenser and fitting an ejector or inducing nozzle on the main condenser to withdraw the comparatively richly air-laden vapor, which usually remains in a condenser despite the efforts of the air pump to withdraw it.

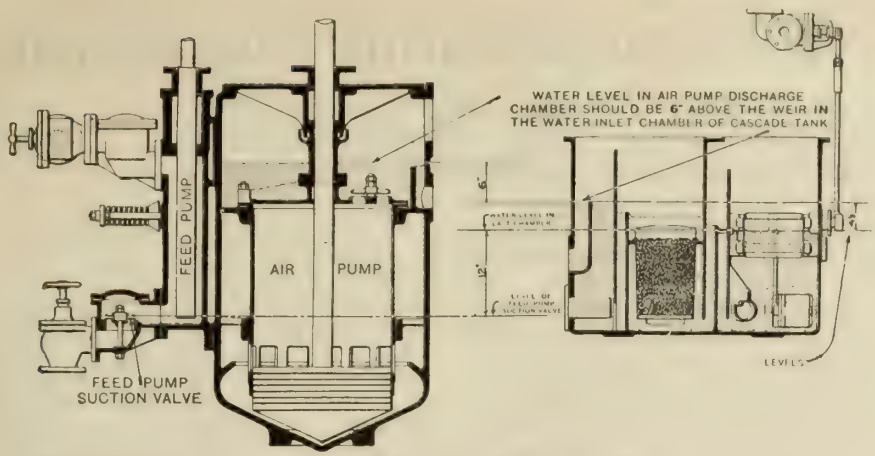
In an ordinary condenser the lower rows of tubes soon lose their efficiency due to oil being deposited on their surfaces and also on account of water dripping on to them from the upper tubes and preventing the steam from getting into close contact with the cooling surface. Every sea-going engineer knows that to maintain a vacuum of more than 23¼" or 24" in warm water entails the pumping of a large amount of circulating water, but in the Contraflo system, on account of the large volume of steam and air removed by the inducing nozzle it has been demonstrated that a vacuum of 27" can be maintained in the main condenser, with sea water at 80° to 85° F.; also that the cooling surface can be materially reduced.

The ejector receives its steam supply usually from the circulating pump engine exhaust and delivers the steam and air mixture to the small jet condenser, which is placed on the air pump suction pipe. The condensing water used in this jet condenser is simply a small amount of the condensate discharged by the air pump and is drawn back to the jet condenser and thence again passes back into the air pump, being in effect a closed system. A water seat or U leg is formed between main condenser and air pump on the air pump suction pipe, to prevent the air and water vapor discharged by the ejector returning back to the main condenser.

On account of the smaller condensing surface required in the "Contraflo" system due to the employment of the steam jet, etc., a lesser quantity of circulating water is required and therefore a smaller circulating pump; also less of the heat in the exhaust steam from the low pressure cylinder of the main engine is transferred to the circulating water and lost overboard, as the steam ejector replaces about one-fifth of the tube surface normally required and collects a large



DIAGRAMMATIC ARRANGEMENT OF CONTRAFLO COMPENSATOR STEAM FEED HEATING SYSTEM.



ARRANGEMENT SHOWING APPROXIMATE POSITION OF THE CASCADE RELATIVELY TO THE AIR PUMP DISCHARGE VALVES AND THE FEED PUMP SUCTION VALVES.

volume of uncondensed steam and vapor from the main condenser and delivers it into the small jet condenser, where its heat is transferred to the condensate (or boiler feed water), as is also the heat in the steam passing through the ejector from the circulating pump engine exhaust.

The recognized best cargo steamer practice as recommended by the guidance specification of the North-east Coast Institution of Engineers and Shipbuilders provides for 1½ sq. ft. of condensing surface per normal indicated horsepower at sea; on this basis 2,000 h.p. would require 3,000 sq. ft., or, say, 15,300 lineal feet of brass tubing ¾ in. diameter. By installing the "Contraflo" system for main condenser about one-fifth of this tubing could be saved.

A test was carried out in England some time ago in the presence of representatives of the British Controller of Shipping, the North-east Institution of Engineers and Shipbuilders and other bodies, to determine the relative efficiency of the "Contraflo" winch condenser, as compared with one of ordinary circular shell type. The result showed that a "Contraflo" condenser of 250 sq. ft. could effectively perform the same duty as an ordinary condenser of 600 sq. ft. surface, the duty in this case being to condense 15,000 lbs. steam per hour. The weight of the "Contraflo" condenser was 30% less; the saving in cost on 100 winch condensers supplied for British standard ships was $89,000. Th "Contraflo" system has been largely adopted in the British mercantile marine and that of other countries and a contract has recently been entered into with the United States Emergency Fleet Corporation for the supply of this apparatus on 320 ships with the option of putting it on all they build. The system is also being fitted on a number of vessels building in Canada.

The cuts accompanying this article illustrate some of the "Contraflo" details.

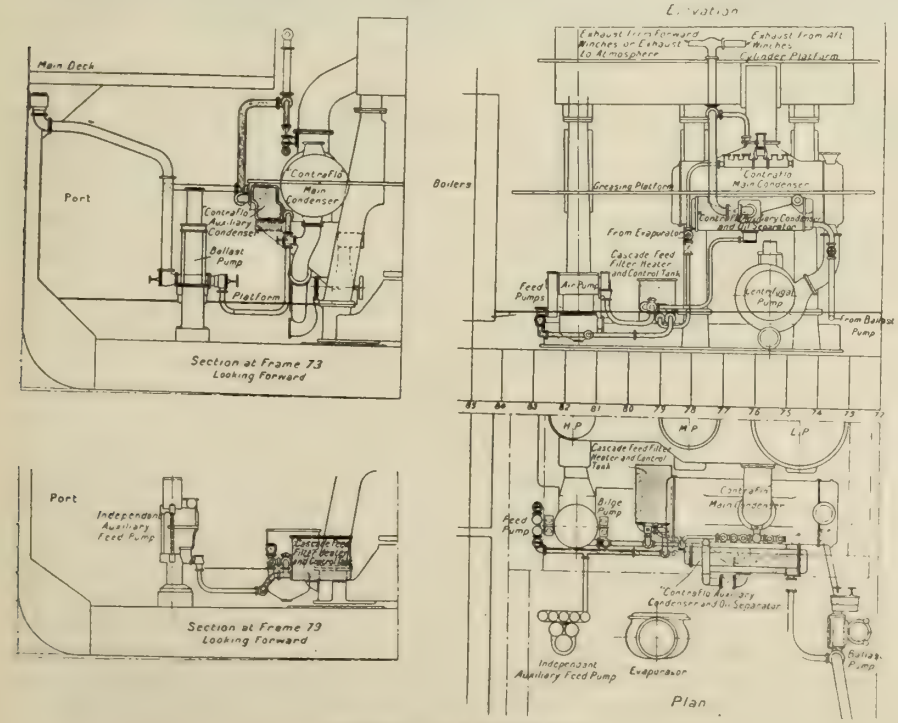
Cut No. 1 illustrates diagrammatically the quantity of heat in steam taken from a ship's boilers for the auxiliary machinery, and also how much of this heat is returned to the boiler with the feed water under the "Contraflo" system.

Cut No. 2 illustrates the latest and simplest arrangement of the "Contraflo" auxiliary system and piping connections in diagrammatic form; this is the system that is now being fitted to the British standard ships. The letter press with this cut gives the setting and operation of the various valves.

Cut No. 3 shows the cascade filter tank in its proper relative position as regards levels in connection with feed pump valves of the main engine. For independent feed pumps the water level over the suction valves of the pumps should be the same as for engine-driven pumps.

Cuts Nos. 4 and 5 show a new arrangement of the main engine and auxiliary machinery covered by the "Contraflo" patents and being fitted to British standard ships. These are specially interesting as showing the centrifugal pump, cascade tank, and winch condenser all directly attached to the main engine, thus permitting the piping in connection with same being fitted and assembled in the shops, whereas with the ordinary arrangement most of this piping would otherwise have to be fitted aboard ship. The new arrangement results in both a saving of piping and of labor, because in the ordinary ship board arrangements of auxiliaries and piping only about 27% of the total piping in the system can be fitted in the shops, yet under the new "Contraflo" arrangement as illustrated it is possible to fit up to 60% of the piping in the shops and the piping is considerably shorter. Cut No. 5 also shows the auxiliary jet condenser fitted on the air pump suction pipe in conjunction with the steam ejector system.

There are various other arrangements of the "Contraflo" system to suit special requirements, one of these modifications being the elimination of the engine-driven air pump and its replacement by a small rotary kinetic air pump and condensate pump combined in one casing and driven by a small steam turbine; this is used in conjunction with the steam ejector system and is specially suitable for large powered vessels, resulting in a very appreciable saving in cost, weight and space.



GENERAL ARRANGEMENT.

Victoria.—The Japanese are planning an extensive shipbuilding program for the immediate future. Among the vessels projected are several of 20,000 tons for the Nippon Yushon Kaisha. The first of these will be built in a British shipyard, and the following ones built in Japan, using the first as a model. Three vessels of about 6,000 tons for the passenger trade between Japan and Shanghai are also contemplated.

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

HAVING considered in a previous article the metals most largely used in marine engine construction, which have iron as their base, we will now consider those of a different nature.

Metals having a base other than iron are usually spoken of as non-ferrous metals, and the kind we are chiefly concerned with is copper. Copper mixed with various alloys enters largely into marine construction, both on hull and engines, and it will be time well spent by the young engineer to gain some acquaintance with it.

Copper has been in use since the earliest ages. It was discovered and used long before iron. There is a piece of bronze in the British Museum that is known to have been part of the sceptre of a king who flourished in the year 3000 B.C., that is 5,000 years ago.

Copper is found in various parts of the world, including the United States, Canada, South America, Australasia, Malay States, etc.

It is found chiefly in the form of ore, but a relatively small amount occurs in bulk form, and is known as native copper. There are several varieties of ore, divided into groups, the chief of which are the sulphite groups. The principal ones of these groups are bornite, chalcocite and chalcopyrite. These ores provide the larger portion of the world's supply of copper.

Bornite contains 55.5 per cent. of copper, 16.4 per cent. iron, 28.1 per cent. sulphur.

Chalcocite contains 79.8 per cent. copper, and is the richest commercial ore known.

Chalcopyrite contains about 35 per cent. copper and 30 per cent. iron, and is the next most important ore to chalcocite.

The ore-bearing rock is brought from the mine, goes through a process of concentrating, which is really separating the large from the small masses. It then passes through crushers, which gradually reduce it in size, and then goes through jigs, which separate the rock from the ore. The very fine crushings, which are called slimes, are treated on special concentrators, which separate the finely crushed rock from the ore.

When this process has gone as far as possible the remaining ore is shipped to the smelter to be refined.

The process of refining copper is not performed in one operation, as in the case of iron ore. It goes on through several steps till the final result is achieved.

The sulphide copper ores possess an excess of sulphur, and there is also present some iron which has to be eliminated. The sulphur used to be removed by a process of roasting in heaps, which is still adhered to in some cases, but is being displaced by what is known as pyritic or semi-pyritic smelting. This means that the heat of the chemical reactions in the constituents of the ore is used to provide the heat for smelting them.

The heap roasting as carried out in one mine formerly consisted in piling selected ore in piles of about 400 tons, which were fired by wood, not more than one cord being used for this purpose. They would then burn for six or seven months. As it is the sulphur which is ignited by the wood, and continues to burn, the percentage of sulphur remaining at the end of the time is very low.

The de-sulphurized ore is now ready for smelting, and this is performed in either a blast furnace or a reverberatory furnace. The blast furnace has been used for smelting metals from the earliest years of the human race. In those times the blast was supplied by the human lung. Now it is provided by a mechanical blower, and the air supplied usually preheated. In smelting copper ore the fuel used is usually coke, and certain fluxes are added to facilitate the making of a slag which carried off the impurities. Limestone is used for this purpose, though in some cases the flux is made by adding ores of a different composition.

In the reverberatory furnace the fuel is on a hearth and the charge on a bed back from and above the fire. The flames and hot gases from the fire are deflected to the charge from an arch above.

The first fusion results in a semi-metallic slag known as matte. The composition of this varies, but runs from 15 per cent. to 50 per cent. copper. The slag formed is usually free from copper. If the charge is blown in the first fusion, till the matte contains over 50 per cent. copper, considerable waste is entailed in the slag.

This low grade matte is then taken to a Bessemer converter, where the remaining sulphur and iron is burned out, and the resulting metal is known as blister copper, which is about 99 per cent. copper. Some of this blister copper is suitable for commercial uses, but usually it has to be still further refined, which is done in electric furnaces.

Use of Copper and Alloys

The use of copper and its alloys in marine practice is very general. At one time practically every steam pipe and all pipes except bilge pipes, were made of copper, but later practice is developing the use of steel pipes as a substitute for copper, for main steam pipes. Copper was also used for sheathing the hulls below water of wooden vessels. It is still used for that purpose in some shallow draught vessels stationed in tropical waters. In these vessels the hull is sheathed with wood up to the water line, and then the wood sheathed with copper. This is usually only employed on gunboats and small naval craft, where cost of construction is not a serious factor. Copper, zinc and tin in definite proportions are used to make brass and bronze, which enter so largely into marine engine use. They are mixed in different proportions, according to the purposes they are to be used for.

The white metal used in bearings is composed of approximately 3.7 per cent. copper, 89 per cent. tin and 7.3 per cent. antimony. These proportions vary according to the opinion of the various makers, some making the metal harder by a large proportion of tin, or some other modification.

Brass or bronze is used in bearings, pipe flanges, condenser plates and tubes, valves, pump liners, pump rods, plungers and pistons. Brass studs and bolts are used where iron or steel would corrode or cause corrosion. Brass is used as a sleeve for tail end shafts, and as a liner in the stern tube, but not to prevent corrosion as sometimes imagined.

There are a number of special metals, such as Delta, Muntz, Bell, named after the makers. There are also special bronzes, as phosphor bronze and manganese bronze, so called on account of the inclusion of phosphor and manganese in their composition. Phosphor bronze is used very largely in the worms of steering engines, while manganese bronze is employed chiefly in propeller blades.

Taking up the ordinary compositions first, we find common brass is composed of approximately 84 per cent. copper, 6 per cent. zinc and ten per cent. tin. A harder brass can be provided by increasing the tin content, and lessening the copper and zinc ingredients. The brass used in making valves is about 90 per cent. copper and 10 per cent. tin, making a very hard and strong composition. Brass wire, such as is used in springs on pump valves, will be made of copper, 95 per cent., tin 4.5 per cent., and about .5 per cent. of phosphor tin. This mixture has especially good properties of resisting moisture. The bushings used in machine tools are about 80 per cent. copper and 20 per cent. tin. Brass used in engine bearings will run about 88 per cent. copper and 12 per

cent. tin, while if a special hard brass for this purpose is required the percentage of tin is increased to about 16 per cent. Muntz metal, largely used for bolts and studs, and also supplied in a ship's stores in sheets ⅛ in. and ¼ in. thick, is about 60 per cent. copper and 40 per cent. zinc.

A metal much used for propeller blades and piston and pump rods, where great strength is required, is Delta metal. This is a bronze made in different compositions, known by numbers. It is specially strong, being stronger in tensile strength than mild steel. It also possesses the property of being easily forged when heated to a dull red. Gun metal is made of 88 per cent. copper, 10 per cent. tin and 2 per cent. zinc, and is much used in marine work. The metal spoken of previously, manganese bronze, is composed of copper, about 60 per cent., tin 75 per cent., zinc 37 per cent., iron up to but no more than 1 per cent., aluminum .5 per cent., manganese .3 per cent.



CONVERTER SHED, GRANBY SMELTER, GRAND FORKS.

Aluminum does not enter into marine work to any great extent, but it is often used for making patterns of articles that have to be cast in large quantities. It will not warp, and produces a very clean, smooth casting. Fire bars are a good example of where an aluminum pattern can be used to advantage.

Brass Furnaces

In most shipyards or marine engine works, where there is an iron foundry, a brass foundry is to be found. This is usually a small affair, and almost invariably it is sunk beneath the level of the floor. This is for convenience, not of charging, but of withdrawing.

Brass is melted in a crucible, usually made of graphite. The fuel used is coke, and the crucible is withdrawn when the metal is melted by a pair of tongs. It is for this reason that the furnace is made below the ground level. A man can stand on the floor, reach down with his curved tongs, and withdraw the hot metal in the crucible. It is a hot and unpleasant job.

Lead Pipes

There are several places on board ship where lead pipe is in use. In locations where a pipe is liable to be submerged for long periods, such as in engine-room and hold bilges, the pipes are usually of lead. This is so that corrosion will not take place. It has another advantage that is not considered by the designers, but is often appreciated by marine engineers. When a bilge suction pipe gets choked, as will happen occasionally, and the water gets too high for a man to reach the bottom of the pipe, it is an easy matter to cut a piece out of the pipe as low down as can be reached. This allows the water to get in the pipe and keep the level down while the suction box is cleared. Then a hot soldering iron and a piece of sheet lead makes a quick repair.

Lead pipe is also used in the ballast tanks, the portion of the ballast pump suction actually in the tank being made of this material. The pipes in connection with sanitary equipment are also to some extent lead pipe.

Where Copper and Brass are Used

Steam and exhaust piping on main and auxiliary engines, suction and discharge pipes of pumps are made of copper. The dynamo also requires copper for the commutator, and of course, switches, circuit breakers and wiring throughout the ship are made of the same metal. Brass is spread pretty near all over the main engines, and as far as the propeller. Starting at the top of the cylinders, we find it used on grease cups and indicator cocks, cylinder neck bushes, valve spindle guide bushings, the nuts on valve spindles inside the chest, the sliding block in link motions, all oil cups and boxes, oil pipes, water service pipes, air pump lever link bearings, guards, round crank pits, etc. The thrust block adjusting screws and nuts, the stern gland and gland studs and nuts, stern tube bushings, tail end shaft liners, propeller and nut, all boiler mountings. Quite a comprehensive list, is it not?

Babbitt or white metal is found in the main bearings, connecting-rod end bearings, eccentric sheaves, thrust collars, guide shoes. The auxiliary machinery of course requires its quota of brass and copper.

Having in this article and the previous one learned something of the various metals used in the marine engine, and also in the hull construction, we will in a future article consider their application in the construction of a vessel and her engines.

NOVEL METHOD OF SHIP SALVAGE

The salvage of the new steamship "Tours," which went ashore at Hunt's Bay, on the Gower coast, some months ago, is being attempted by a novel method.

The plan adopted is to construct launch ways as in shipbuilding yards, with ground ways mounted upon cement foundations, the intention being to launch the vessel broadside on from the rocks as soon as sufficient depth of water is available. A considerable amount of blasting was necessary to clear away projecting rocks, and this operation had not been completed when an unsuccessful attempt was made to refloat the vessel in April. It was hoped to make another attempt at the high spring tides in the early part of May, but unfortunately stormy weather at the latter part of April washed away some of the slipways and destroyed the foundations, so that no further progress could be made.

The salvors have since been devoting themselves to repairing the damage then caused, and another attempt is to be made in June should the weather conditions be favorable. A large sum of money has been already expended on what is looked upon in some quarters as a forlorn hope, but the advisers of the salvors are still sanguine of success.—"Times" Supplement.

HOLMES METALLIC PACKING

The makers of this packing, the Holmes Metallic Packing Co., Wilkesbarre, Pa., have just issued an attractive catalogue describing their product.

This packing is made in a split case, which fits into the stuffing box, and can be fitted without removing the rod. The packing itself is made up of metallic rings, divided in three segments, and with a spring sitting in a groove in the circumference of the ring. The number of rings used depends on the depths of the stuffing box, and there are modified designs for special purposes.

The packing has been on the market for twenty years and has proved very successful. The makers guarantee the packing for three years.

THE TRIAL TRIP OF THE CANADIAN RANGER

Special to MARINE ENGINEERING.

BY the courtesy of Mr. Alex. Johnston, Deputy Minister of Marine and Fisheries, your representative was present at the trial trip of the Canadian Ranger, the second ship to be launched under the program for the construction of a Canadian merchant marine. The first ship, the Canadian Pioneer, is now on a voyage to South America, and although the figures have not yet been given out, it is known that she carried a cargo of so extraordinarily profitable a nature, that a very few similar voyages would pay for her.

The party present at the trial trip of the Canadian Ranger consisted of Col. Cantley, director of the Canadian National Railways; Mr. Alex. Johnston, Deputy Minister of Marine and Fisheries; Mr. H. Cameron, manager and representative of the Canadian Vickers Company; Mr. C. F. M. Duguid, naval constructor of the department, who was responsible for the designing and construction of the ship; Mr. H. W. Cowan, operating manager of the Canada Steamships Company; Mr. Hobson, treasurer of the same company; and representatives of the press gallery in the House of Commons. The party were the guests of Mr. J. W. Norcross, president of the Canada Steamships Company, and of the above mentioned officials, from Montreal to Quebec and return, excellent accommodation and fine courtesy being extended to them on the luxurious ship "Saguenay," which is appointed and conducted on the lines of the finest ships afloat.

The Canadian Ranger lay in the stream at Quebec, dressed in her full suit of colors for the occasion; and she presented a sight calculated to stir the enthusiasm of any Canadian, with the Canadian flag flying at her masthead, an earnest of the future when that flag will be flying on Canadian Government ships all over the world.

She had a full cargo of sugar, tinned goods, and eggs, with a deck-load of lumber. The log of our short voyage is concise and uneventful. Leaving Quebec at 8.55 a.m., on May 31st, the Ranger proceeded on her official trial of six hours as far as Murray Bay, where we said farewell to her and returned to port on the D.G.S. Druid, while she proceeded on her way to Great Britain. We were advised that all her main propelling engines and auxiliaries worked satisfactorily, a speed of 12 knots being obtained for the six hours run.

The Ranger is under command of Captain Nicholls, who has seen much service during the war on submarines and other ships, and wears both British and Russian decorations. He has had a ship torpedoed under him, as has also the first officer, a New Brunswicker, who returned recently after spending two years in a German prison. The chief engineer is not a Scotchman this time. He is a native of Montreal, named Webster, and served on trawlers and drifters during the war.

During the trip down on the Saguenay, the party tested the hospitality of the Canada Steamships Company to the utmost, and it was lacking in nothing. At a dinner tendered to them on board by the company, the menu and other arrangements were so unusually fine that the chef was requested to appear and receive the cordon bleu, hastily improvised for the occasion, which he did with native French grace

At a gathering of shipping men and newspapermen, it was natural that the whole question of Canadian shipping should be threshed out, and it was done with as much vigor, and perhaps more genuineness than in the House of Commons itself. If their official position, perhaps, prevented the representatives of the department from expressing themselves frankly, there was no such limitation on the utterances of the press gallery, the members of which realize that the large sums being spent on the construction of our commercial fleet will all come back to the treasury by a graduated scheme of amortization within the next ten years; and if present indications may be accepted, the Canadian National Railways, which are operating the ships, will, with reasonably capable and independent management, have the ships paid for and a surplus besides. Judging from much that has been said in the debates on this shipping program, the expenditure is being put in the same class with money spent on wharves and breakwaters, which are necessary, but not directly productive. Here it is proposed that every dollar spent on this program shall come back to the people of Canada with interest; and unless all commercial conditions in the world absolutely become paralyzed, or the management is criminally inefficient, this is what will happen. It is well known that any shipping company on the continent would be glad to take over the ships on the terms on which the Canadian National Railways is getting them. Apparently the only mistake in this policy is that it was not gone into earlier. If it had been, when first urged on the Government, there would be at least ten ships ready to-day, and the capital expended would have been returned with a surplus.

For some ulterior reason, there has been a great deal of misrepresentation uttered and published, both in the press, in the House and in the Senate, especially regarding the Government shipbuilding. It is a fact that ships are being turned out from Canadian yards for the Government at substantially lower rates than those at which similar ships are being constructed in the United States. It was stated by Senator Turriff recently, for example, that shipbuilding yards in the Old Country were prepared to take contracts for delivery next spring at from £19 to £21 per ton, whereas it is asserted positively by the Marine Department to your representative, that, as a result of recent cables to make sure of this point, no genuine offer from any shipbuilding concern in the United Kingdom can be obtained for delivery next spring of ships of the class now being built for the Government.

The same Senator made the statement, absurd on the face of it, that the Canadian Naval Department offered to equip the new ships with wireless for forty-three dollars each. The department's offer really was to provide a service for an annual charge of $1,324.50 for each ship. For fifty-five dollars more the Department of Marine got the Marconi service, which includes keeping the instruments in condition by experts in every part of the world—a very good bargain.

The following is a description of the Canadian Ranger, and it applies to all vessels of the 8,100 ton type:

Length b.p., 400 feet.
Breadth moulded, 52 feet.
Depth moulded, 31 feet.
Draft load, 25 ft. 1 in.
Deadweight carrying capacity, 8,100 tons.
Speed on trial, 12 knots.
Complement officers and men, 45.

The vessels are of the two-deck type, with poop bridge and forecastle, straight stem, elliptical stern, and 6 w.t. bulkheads.

A double bottom 43 inches deep, with solid floors on every third frame, extends from end to end of the vessel with the usual facilities for filling and emptying.

The vessels are framed on the transverse system, with a 26 inch frame spacing, bulb angle being used for both frames and beams. To facilitate stowage of cargo, side stringers have been dispensed with and the outside plating correspondingly increased. All the decks are plated with steel. On the poop and in way of accommodation the decks are sheathed with B. C. fir. The cargo hatches are arranged for expeditiously handling cargo and are of the following dimensions:

No. 1 hatch, 2 ft. 6 in. x 26 ft.
No. 2 hatch, 34 ft. 8 in .2x6
No. 4 hatch, 34 ft. 8 in. x 26 ft.
No. 5 hatch, 30 ft. 4 in. x 26 ft.

Hatch on bridge deck, 18 ft. x 10 ft

Widely spaced pillars in cargo holds have been adopted to reduce to the minimum obstruction in handling cargoes. For the working of the hatches four derrick posts are provided: two between the forward pair and two between the after pair of hatches with two derricks to each mast. The cross bunker hatch on bridge deck is operated by two der-

rick posts, having ventilator tops and one derrick to each post. All derricks have a five-ton lifting capacity.

Ten cargo winches are fitted on board, two each to the four main cargo hatches, one on bridge and one on poop deck. These are of Clark, Chapman type, having cylinders 7 in. in diameter by 12 in. stroke.

The vessel has two steel lower masts with B. C. fir lowering top masts to suit the Manchester canal bridges, carrying the wireless aerials. The anchor equipment is as required by Lloyds, viz.:

2 bower anchors, 60 cwt. stockless.
1 bower anchor, 50½ cwt. stockless.
1 stream anchor, 16¼ cwt. ex-stock.
1 kedge anchor, 7 cwt. ex-stock.

And 210 fathoms 2 3-16 in. stud link chain cable, together with stream chain manila hawsers and warps.

The seamen's and firemen's accommodations are situated aft under the poop with the wireless office and cabin aft, all on upper bridge. An internal stairway communicates with the officers' accommodation below. The cold storage chambers and plant are situated on the upper deck, below the after end of bridge deck.

Two fresh-water tanks, each of about 2,500 gallons capacity, have been provided. They are connected to a distiller capable of distilling 1,000 gallons in 24 hours.

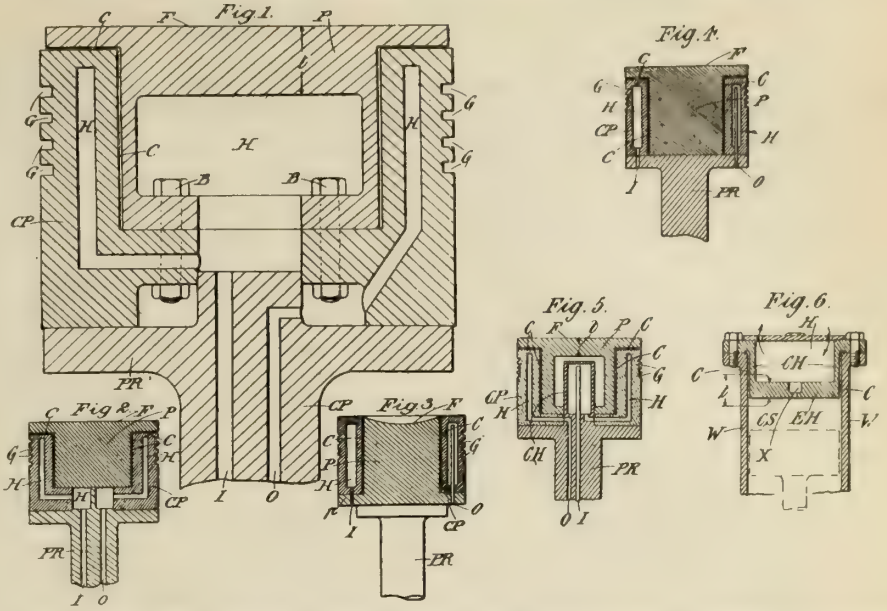
Engines and Boilers

The ship is propelled by one set of triple expansion, surface condensing engines, with cylinders 27 in. x 44 in. x 73 in. by 48 in. stroke. The air pump, with a diameter of 24 in. x 24 in. stroke; the two feed pumps, 4 in. diameter x 24 in. stroke; and the two bilge pumps, 4 in. diam. x 4 in. stroke, are all worked from the main engines. The main circulating pump is of the centrifugal type and is driven by an engine having a 6½ in. diameter cylinder by 6 in. stroke. The reversing engine is made reversible, the gear being of the all-round type and arranged for steam and hand power. The general donkey and feed donkey pumps are of the vertical double acting type, having steam cylinder 9½ in. diam.; water cylinder, 7 in. diam.; and a stroke of 18 in. The ballast donkey pump is also of the vertical double acting type, having steam cylinder, 10½ in. diam.; water cylinder, 14 in. diam.; and a stroke of 24 in.

An evaporator is provided capable of supplying 25 tons of fresh water per 24 hours. The usual filter, feed-water heater, winch condenser, telegraphs, etc., are provided. The "Contraflo" system of condensing and feed heating is being fitted to all vessels of this class.

Steam is supplied by three single-ended Scotch boilers working under Howden's system of forced draft, with diameters of 15 ft. 6 in. x 11 ft. 6 in. long, with a working pressure of 180 pounds per square inch. Air is supplied by a fan driven by one single cylinder open type engine, 7½ in. diam. x 5 in. stroke.

THE DOXFORD DIESEL ENGINE



FIGS. 1-5 DIESEL ENGINE PISTON WITH PLUG MAINTAINING TEMPERATURE OF 800° F. FIG. 6 CYLINDER HEAD DESIGNED FOR SAME PURPOSE.

IN the ordinary Diesel engine the temperature to which it is necessary to raise the air within the cylinder at the end of the compression stroke necessitates a high degree of compression, which is generally about 480 lb. to 500 lb. per square inch. If it is possible to maintain some portion of the surfaces of the combustion chamber at a high temperature throughout the whole cycle, say at a temperature of not less than 800 degrees Fahrenheit, then it would be permissible to employ a much lower compression pressure, which could be in the neighborhood of 320 lb. per square inch.

The advantages derived from such an arrangement are obvious; in the first place it allows of a lighter design of engine owing to the reduced pressures, whilst it also facilitates the adoption of a system of solid injection of fuel, which does not present so many difficulties when the pressure to be overcome is not more than 320 lb. per square inch instead of the usual 480 or 500.

In a recent arrangement, patented by Mr. R. P. Doxford and Mr. K. O. Keller, this principle has been carried into effect. The design is intended to apply either to an ordinary vertical Diesel motor with a single piston and a normal cylinder head, or in an opposed-piston engine such as is being developed by Messrs. William Doxford and Sons, wherein two pistons moving outward and inward form on their inward stroke the combustion chamber between the surfaces of the two pistons and the cylinder walls around them.

Dealing with the patented design as it applies to this type of engine, and referring to Fig. 1, it will be noticed that there is a large plug (P), which is exposed at one end to the combustion chamber and to the hot gases. and is bolted at its inner end with the cylindrical portion (C P) of the piston, this being secured to the top end of the piston rod in any convenient manner. In the cylindrical portion of the piston rod are the usual grooves (G) for the piston rings, and in other respects there is no novelty in the design.

There is a large water space (H) for cooling both the cylindrical portion of the piston, the bolts holding the piston to the plug and the bottom of the plug, but the thickness of the plug "t" is sufficient to prevent the cooling water lowering the temperature of the plug at its outer face (F). There is a clearance (C) between the plug and the cylindrical portion of the piston, which allows expansion and contraction of the plug without causing any undesirable stresses in the piston. The plug should be preferably of mild steel, while the piston can be of cast-iron of suitable mixture. In an opposed-piston engine each piston would be designed in this way, whilst in the ordinary Diesel engine the cylinder cover would have a plug instead of the piston, the piston being of normal design. This is illustrated in Fig. 6, whilst Figs. 2, 3, 4, and 5 show alternative arrangements with the opposed-piston type of motor.

Apart from the advantages of lower compression pressure, as mentioned above, it is claimed that with this design, since the high temperature is maintained throughout the whole of the stroke, the efficacy of combustion does not fall off, which is liable to happen with the usual type, especially if solid injection is employed with heavy fuel oil. It is for this reason that with solid injection it is the custom to use the lighter grade of fuel oil.

We understand that this system is to be employed in the 3,000 h.p. four-cylinder motor of the opposed piston which is now being built by Messrs. Wm. Doxford and Sons, Ltd., at their Sunderland works for installation in a cargo ship.

Eastern and Western Canada Marine Activities

May Correspondence

WHILE the activities in and about the port during the past months have reflected the busy times of pre-war peace shipping, the movements of the past week or so have been affected by the general labor unrest throughout the country. The disturbances here have not been of a character to seriously interfere with the shipping at the port, but the recent lull is chiefly due to labor troubles at the other end, creating a shortage of vessels leaving British and European ports. Work has been in progress for some time on the extensions that will be made this year for harbor accommodation. For the past few weeks F. W. Cowie, harbor engineer, has been supervising the excavation necessary for the construction of two additional sheds, Nos. 17 and 18, on the Victoria pier, and a start on the concrete foundations is already under way. The steel work for these two sheds will be fabricated by the Dominion Bridge Company, and it is expected that the erection will commence within a period of five or six weeks.

A movement is on foot to form a registry at Ottawa for Canadian ships, operated in connection with the newly organized Canadian Merchant Marine. Many difficulties would probably be involved in the formation and the operation of such a registry, and careful consideration would have to be given to all details before adoption would be advisable. One of the chief factors in this connection, as pointed out by Thos. Robb, of the Shipping Federation, would be the measure of protection to such ships in foreign ports. "In the past, large numbers of Canadian ships have traded to all parts of the world," he stated, "and they did so under the Merchant Shipping Act, which, as it stands at present, governs all British and foreign vessels, irrespective of the location of their registration. This might severely handicap Canadian foreign trade should Canada adopt her own registry, until such time as Canada is able to have a fleet of naval vessel patrol, or be stationed at many of the ports of the small foreign republics to the South, to which Canadian vessels may go. At present any question that arises is generally referred to the British naval officer on the station, and the moral effect is often to prevent hasty action in connection with shipments. This is a point that should not be overlooked."

Freight service between Montreal and French ports was started on the last day of May, when the steamship Bilbster, operated by the Compagnie Canadienne Transatlantique Ltee. (Canada Steamship Line) sailed for Havre with general cargo. It is the purpose of this company to give the exporter and importer a regular and reliable service. Six vessels will be used in the service, assuring bi-weekly sailings from either end.

Direct freight service between Montreal and St. John's, Newfoundland, was inaugurated about the middle of the month by the Gulf of St. Lawrence Shipping and Trading Company. The first vessel to be placed in the service is the "Cerro Gardo," one of the boats built by the U. S. Shipping Board, and acquired by the shipping company for operation on this route. For the present the company will confine itself to the handling of freight, but it is anticipated that a passenger service will be started next year providing a suitable vessel can be secured.

Traffic on the Lachine Canal shows a steady increase over previous years in the war period, but is still considerably short of pre-war business. For the month of May the total tonnage passing through the canal was 533,347 tons, and an increase over May of last year of 49,105 tons. The increase of cargo tonnage was over 24,000 tons. Grain was the principal item in the increases, the capacity this year being 4,077,371 bushels, against 1,184,409 bushels for May of last year. Nearly all lines of foodstuffs show increases, this being accounted for by the fact that ocean freight space has been reserved, largely by the British authorities for food transportation to Europe. Coal shipments show a great falling off, the comparison being 172,313 tons against 262,673 tons for May of 1918. The movement down the canal of boats built by the U. S. Shipping Board has been a feature of this season's operations, nearly all these vessels having come down light owing to their deep draft.

A feature of the season's activities will be the entrance into ocean service of a large number of U. S. Shipping Board boats that have been built at yards on the Great Lakes, and are being brought down the canals for their initial service. About seventy of these have already come down, half of them having made their first voyage across the Atlantic, loaded at St. Lawrence ports with foodstuffs for European countries. Others will take similar cargoes at different ports along the East coast. It is estimated that nearly 100,000 tons of foodstuffs have already been shipped by these vessels, in addition to the pulp wood, which comprises the cargoes of several of these new vessels.

Early in the month, at the offices of the Montreal Harbor Commissioners, an interesting ceremony took place in connection with the Navy League of Canada, when a presentation was made to W. G. Ross, M. P. Fennell and R. W. Reford, by Rev. Dr. Alfred Hall, commissioner of the British and Foreign Sailors' Societies, in recognition of their services in connection with the raising of 2½ million dollars for the Navy League, and likewise as a fitting tribute for their unceasing activities on behalf of British sailors during the period of the war. The mark of appreciation was in the form of three salvers, manufactured out of copper fittings taken from the old flagship "Victory," and suitably inscribed with a view of the flagship of Nelson putting into Gibraltar after the battle of Trafalgar.

In connection with the activities of the Navy League it is interesting to note the extreme interest that is being taken in the extension of social welfare work carried out by the two sailors' organizations. The sum of $200,000 was voted at the annual meeting of the Dominion council, held at Victoria last February, for the purpose of erecting a home in Montreal for the Navy League, provided satisfactory arrangements could be made for the amalgamation of the two societies. If the proposed union is not consummated it is expected that a monetary subsidy will be made to each society in order that their individual interests may be extended.

Sixty years' service in behalf of the Montreal Sailors' Institute and general sailors' welfare, has just been completed by the Bell family, Mr. Ritchie Bell, the present manager, just having completed 33 years' service for the institute, the inception of the work having been started by Mr. Bell's grandfather over 60 years ago. Mr. Bell is as enthusiastic to-day as when he first took up the work, fully realizing the importance of this social feature of a sailor's life, and the necessity of molding and maintaining that splendid character that has been the bulwark of the British nation.

After a successful trip across the ocean under her own power, the wartime German submarine UC-97 arrived in the port of Montreal on the evening of May 26 and passed through the lower locks of the Lachine Canal on the following morning. During part of her journey up the river she was towed by the U. S. naval tug Iroquois, which vessel will accompany her during her exhibition tour of the Great Lakes. The submersible is a wicked-looking craft, of 163 ft. long, with a draft of 10 feet when running on the surface. Being of the mine-laying type, she is provided with accommodation for 18 mines, and in addition is fitted with three torpedo tubes and six spare torpedo racks. On the deck is a 4.7 in. quick-firing Krupp gun, non-disappearing, but with the metal so treated that it will resist the action of the water when the boat is submerged. She is typically German, carrying all the earmarks and the national motto, "Gott Mit Uns." Her post-war title is the Ex UC-97.

Differences between the Canadian Vickers, Ltd., and their employees, regarding working conditions, have seriously interfered with the work at this plant, which has been virtually closed for over two weeks. The situation, however, is improving, and a satis-

factory settlement is looked for in the near future, and even before this goes to press the men may be back at work. Several large vessels are under construction, and it was expected that two launchings would take place this month, but the strike has necessitated delay in this connection.

Operations at the shipyard of Fraser, Brace & Co. are proceeding in a satisfactory manner. Two launchings have already been made this month, and probably before the 1st of July the eight vessels will be in the water. At the time of writing there are two awaiting launching, a third being afloat in the basin, and the five hulls first finished are moored in the turning basin adjoining the yar. Three of those first launched are practically completed with the exception of the boilers, which have not yet been delivered. Engines and deck machinery are in place, and as soon as the boilers are received and placed in position they will be ready for their trial trips. The entire fitting out is being done by Fraser, Brace, as the contract called for vessels complete. It is not yet known whether the company will continue in the shipbuilding activities as nothing definite has been arranged as to the future operations in this connection.

British Columbia

THE general industrial strike, which reached out from Winnipeg and Toronto and gripped the Pacific Coast, has imposed serious restrictions on shipping, not only coastwise, but ocean-going as well. Difficulty has been encountered in loading vessels at Vancouver and Victoria, and a seamen's strike on the Canadian Pacific steamers resulted in the tie-up of several of the company's best vessels.

The Empress of Russia managed to get away for the Far East on schedule time with a full cargo, but the Canadian-Australian Royal Mail liner Makura was forced to return to the Antipodes with her hold filled with unpacked mutton. The stevedores in Vancouver were on strike and the crew of the Makura refused to allow a volunteer gang of longshoremen to unload; not only that, they informed their captain that if the volunteers were permitted to work, they would not man the ship on its return voyage to Australia.

The seamen of the C.P.R. vessels walked out, demanding an eight-hour day and $75 per month minimum for deckhands, as well as a few minor concessions. The company maintains that it has agreed to grant these demands and contends that the seamen struck in sympathy with Winnipeg, which is in turn denied by the men, who say they are out as a protest against the C.P.R.'s halting negotiations with them while the strike issue was being discussed. At any rate, the C.P.R. has laid off several of its fastest and best ferry steamships. The Skagway service is tied up completely, as well as the triangle service between Victoria, Vancouver and Seattle. The company has transferred the fast Princess Patricia from the Nanaimo-Vancouver run to the route between Victoria and Vancouver, and the Seattle service is being carried on by an American company.

The Grand Trunk Pacific service to Prince Rupert and northern British Columbia was also considerably disrupted by the strike.

According to information which has reached Premier Oliver, a French steamship line is anxious to handle Pacific Coast business and is contemplating the establishment of regular service between Calais, British Columbia, and way ports. Henri Moreau is head of the firm in question, and Mr. F. C. Wade, agent-general for B. C. in London, has forwarded to Premier Oliver a letter asking for the names of exporters and importers who desire to make use of the proposed service.

The G. T. P. tugboat Lorne, which has been hauling log rafts from Queen Charlotte Islands to the pulp mills on the mainland coast, is believed to have established a record. In sixteen days she made six trips, totaling 1,500 miles, and hauled 4,200,000 feet of logs.

Although still without a definite pronouncement from the Federal Government, Victoria shipping interests are confident that Esquimalt will shortly be given the long-promised dry dock, for which a persistent agitation has been carried on during the present session of Parliament. Both members of the House from this district are equally hopeful of a successful termination of their efforts.

Arthur Meeker, Chicago millionaire, has purchased the steamer Dolaura, which has been owned for some years by Hon. James Dunsmuir, Victoria coal magnate and capitalist. The Dolaura has been lying at anchor in Esquimalt harbor and is now being prepared for a cruise through the inside passage to Alaska. Capt. J. Jacobsen, of Chicago, who has navigated steam yachts on many seas, will be in command. The Dolaura will be fitted out as an oil burner on her return from northern waters and other extensive changes are contemplated before the vessel is taken to the Atlantic seaboard.

The steamer Salvor, formerly operated as a salvage steamer by the British Columbia Salvage Company, now the Pacific Salvage Company, and recently sold to a Montreal shipping company, is now on her way to Bordeaux, France, and may be sold there. Since leaving this coast the Salvor has been operated in the tallow and copra trade in the South Seas. Possessing one of the most interesting histories of any ship plying western waters, the Salvor is over fifty years old. She was formerly named the Danube and in 1873 was commissioned to carry the remains of Dr. Livingstone, the African explorer, from the Congo Coast to England.

The Foundation Company, under contract with the French Government for the delivery of twenty wooden steamships of 3,500 tons before the close of the year, is making fast time. Since April 26, less than two months ago, five vessels have been put into the water and the machinery parts are now being assembled in the hulls at Ogden Point, at the entrance to Victoria harbor, where the company has installed the largest shipbuilding plant in the Northwest. The recent launchings were as follows: S.S. Winnipeg, April 26; Montcalm, May 12; Ontario, May 22; Canada, June 2; Ottawa, June 16. The company is endeavoring to launch one vessel every ten days.

Steel is now arriving steadily at the plant of the Harbor & Marine Company, Victoria, which has secured orders from the Federal Government for the construct of two 8,100-ton steel cargo-carriers. Several large shipments have reached the yard during the past few days, and an actual start on hull construction will be possible almost immediately. Mr. C. J. V. Spratt, manager of the Harbor & Marine Company, has been taking an active interest in the Esquimalt dry dock issue and states that he believes it is highly probable that an English engineering concern of world-wide reputation will undertake to build the big dock should the Government decline to do so.

The time-worn suit between the firm of Grant, Smith & Macdonnell, Ltd., and the Federal Government to recover moneys said to be owing the engineering firm in connection with the Ogden Point breakwater at Victoria, has been revived, and several Victoria men left for Ottawa to give evidence recently. The case was scheduled to open June 17 in the Exchequer Court. It is the result of a dispute between the Government and the contractors that dates back to 1916. There was an official investigation at that time into certain allegations that the contractors were asking payment for the removal of rock for the dock curb foundations when it was really only sand that was being removed. The Government paid only for the removal of sand. The company, it is understood, still claims that rock was being excavated, and not sand, and asks full payment accordingly.

The steam trawler Givenchy, which reached Esquimalt from Halifax recently, will be operated in the fisheries patrol service. There are about twenty vessels already in this service on the coast, but most of them are gasboats. The trawler will be the largest of the fleet. The trawlers Armentieres, Thiepval and Stadacona are also to make their headquarters here. The Stadacona lost her rudder off the coast and is now being outfitted at San Francisco.

The sailing vessels and two auxiliary schooners, all owned by Cornelius Bull and Mons Isaakson, of Christiania, Norway, started from Northwest ports recently on a time race to England. Heavy wagers are reported to have been laid among the Norwegian marine fraternity on the various craft. The Mount

Shasta and Mount Hamilton are the two auxiliary powered vessels, while the Mount Hood and Mount Whitney are the sailors.

Cable advices have been received from Australia that the Union Steamship Company of New Zealand has placed an order with a Clyde shipbuilding concern for the construction of a 14,000-ton passenger liner, which will operate between Victoria, Vancouver and Australia in conjunction with the steamship Niagara.

Considerable interest has been shown locally in the murder charge laid against Captain "Hellfire" Pederson and his son, Adolph, master and mate respectively of the barque Puako, which left Victoria last summer with a lumber cargo for South Africa. The trial was held in New York and Pederson and his son were acquitted by a Federal jury, which required only six minutes to reach a decision. It was charged that Axel Hansen, a sailor on the Puako, had been brutally treated by Pederson and his son and that in desperation he had leapt overboard. It was contended that Capt. Pederson had refused to turn his ship round to pick up Hansen. In defence it was stated that it would have been impossible to turn the ship round, because of a gale that was raging at the time.

The big light that has been maintained at Triangle Island at the northern tip of Vancouver Island as an aid to navigation for nine years will be dismantled. The light is 700 feet above high water, and the exposed position of the rock has made it extremely difficult to land supplies there. Shipping interests were consulted before the decision to dismantle was reached. Navigators claimed that the Triangle light was now of little use, as the powerful Estevan Point light was used almost exclusively by ships in that quarter.

The Palo Alto, the first terra cotta ship ever launched, slid down the ways of an Oakland, Calf., shipyard a few days ago. It is not only the largest concrete vessel ever built, but differs materially as to architecture and composition from the Faith, the first concrete ship launched. The concrete mixture of which the ship is largely composed, contained up to the second deck line terra cotta, which was about 30 per cent. of the construction, while the remainder of the construction contained burnt brick. The purpose of using brick, which is pulverized for the concrete mix, is to lessen the weight of the vessel. The brick mixture makes the concrete mix one-seventh lighter in weight than concrete from which previous stone ships were built. The Palo Alto is to be used as an oil carrier.

GETTING MARKETS ABROAD

It is a well-established fact that during the last three years Canada has become a producer of marine auxiliary machinery in respectable quantities. Nearly all the winches, windlasses, steering gears, etc., that have gone into ships built in Canada have been of Canadian manufacture, and a considerable number of the engine room auxiliaries have also been built here.

When the rush and hurry of war-times subsided somewhat, and there was time to look around, it was found that some of these machines were being produced at a speed and cost that could compare very favorably with the figures shown by British firms.

As an instance, the Northern Foundry & Machine Co., Ltd., of Sault Ste. Marie, which has been busy producing shells for a large part of the war, turned its attention some time before the armistice was signed to the manufacture of marine machinery, and adopted a wide variety of lines. These include besides the cargo winches, windlasses, and steering gears usually made, hand steering gears, deck pumps, port lights, and marine forgings. In this they have been very successful, and have reached a stage of efficiency where two complete winches can be turned out in a day.



WILLIAM C. WILSON.

The William C. Wilson Co., of Toronto, marine and contracting engineers, are the agents for this firm. Mr. William C. Wilson, looking over the possibilities of wider markets, noted the congestion in the engineering industry in Great Britain and conceived the idea of introducing auxiliary machinery of Canadian manufacture into the birthplace of all machinery.

For this purpose Mr. Wilson is sailing for England early in July. He is confident that he can produce an article of equal quality to that of purely old country manufacture, at as favorable a price, and with better delivery. This last feature is an all-important one in these troublous times, and it is quite probable that Mr. Wilson's foresight and enterprise will be rewarded by a goodly string of orders from old country clients.

This way of securing an export market for Canadian goods is surer and quicker than awaiting the help of commissions, however well disposed the may be to help the manufacturer.

MANGANESE BRONZE FOR PROPELLERS

A booklet has lately been issued by the American Manganese Bronze Company, of Holmesburg, Pa., called, "Manganese Bronze—the Legitimate Metal for Propellers."

This company is well qualified to speak on such a subject. Recently they delivered the first propeller on a contract for 40 to the Hog Island shipyard. These are for the "B" class of standard ship building there.

The propeller weighed 34,000 lbs., and is 18 feet 6 inches in diameter. In addition to this contract the company are making propellers for the Canadian Vickers, Standard Shipbuilding Corporation, Federal Shipbuilding Company, and Emergency Fleet Corporation.

The melting is done in a reverberatory furnace with a capacity of fifteen tons, and sometimes two heats a day are run off. The range of propellers turned out is from 10 inches to 20 feet in diameter.

The company is under the management of James B. Curtis, president; Charles R. Spare, vice-president, and T. H. Addie, vice-president and treasurer.

A LARGE MARINE WELD

The Metal and Thermit Corporation, New York, has recently and successfully completed the largest marine weld ever recorded on the cast steel stern frame of the huge U. S. army transport, "Northern Pacific." The section welded was entirely broken through as a result of a severe strain to which the frame was subjected when this transport, laden with homeward-bound troops, ran aground on January 2, 1919, in a dense fog, off Fire Island, New York. The stern frame was broken just above the upper rudder lug, in a position where the casting was hollow, and measured almost two feet in diameter. The walls of the casting at this point measured about three inches thick.

The weld, which required 1,400 lbs. of thermit for the chemical production of the necessary amount of molten steel, and which was made without removing the casting from the ship, obviated the delay and expense which would have been entailed by the only alternative of purchasing an enormous new casting and installing it at a cost probably exceeding $50,000.

London.—The application of the Canadian Pacific Railway Company to transfer a number of their ships to Canadian registry is freely rumored here. Sir George McL. Brown admitted that he had heard of it. It is said that Chairman Bosworth has sailed for Canada to discuss the matter with the heads of the line there. This action is considered to be the great step in the formation of a Canadian mercantile marine, as it is expected that probably other lines sailing to and from Canada may follow the C.P.R.'s lead to some extent.

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

A PORTABLE ELECTRIC DRILL

A portable electric drilling machine has recently been advantageously employed in countersinking ship plates at a number of fabricating shops engaged in work for the Emergency Fleet Corporation. A wall radial drill has usually been used for this purpose, but the portable electric drilling machine attached to a buggy designed for the purpose has resulted in greater speed and a reduction of labor cost.

The buggy shown in the illustration was supplied by the Louis F. Shoemaker Co., Pottstown, Pa. This company has supplied a similar buggy to the Hog Island yard of the American International Shipbuilding Corporation. Buggies similar in design have been built by other fabricating shops.

For use with this buggy the Van Dorn Electric Tool Co., of Cleveland, has recently designed a portable drilling machine, very powerful and of heavy, rigid construction. The machine is fastened into the buggy by two studs, these studs being screwed to trunnion bosses on the housing and fastened to the handles of the buggy. The buggy is counterweighted in front, leverage being provided by pressure applied to the handles.

The Van Dorn portable electric machine is ball-bearing throughout. The top head and gear housing are bolted to the motor housing, eliminating tapped holes and wornout threads. A double row of ball-bearings withstand both thrust and radial load.

This particular machine is for use with direct current, but the Van Dorn people will also furnish machines for alternating current. It consumes 230 volts. Its maximum speed is 425 r.p.m. and 160 r.p.m. under full load. Its spindle output at 20 amp. is 4½ h.p.

The machine measures 22 inches over all in length and weighs 125 lbs. It is equipped with No. 4 Morse taper socket and will countersink a hole up to one inch in diameter. It is claimed that the buggy enables this machine to countersink a ⅞ inch hole in 7 seconds.

KELLER VALVELESS AIR DRILL

The new Keller-Master drill, recently placed upon the market, illustrated herewith, is the result of a long period of experiment and development, dating back, so it is claimed by Mr. Keller, to the very establishment of the Keller Pneumatic Tool Company. In presenting this drill to the trade, Mr. Keller proclaims it as a striking and substantial step in advance of the hitherto-accepted best in pneumatic drill practice, basing his claim upon the following points:

There is no part of the drill that is any stronger or any weaker, for the part it has to do, than any other part. Every part is scientifically correct—not merely for size, but for relative strength. The whole assembly is an accurate co-ordination of perfect mechanical units, precluding all possibility of premature wear or improper functioning.

It is light in weight, compact in size and on account of the elimination of the usual delicate valve mechanism which has heretofore been a source of expense and annoyance, will stand up under the most severe service and under the greatest amount of abuse. It also possesses the added advantage of exceptional economy in air consumption. It is positively claimed that this drill will require less attention and cost less for maintenance than any portable drill made.

Details of design and construction are as follows: Four single-acting pistons arranged in pairs at right angles, each pair connected to opposite writs of the crank shafts. Perfect balance insures smooth running and freedom from vibration. The one-piece cylinder body is provided with handhold openings, neatly covered with removable plates, giving ready access to crank connections.

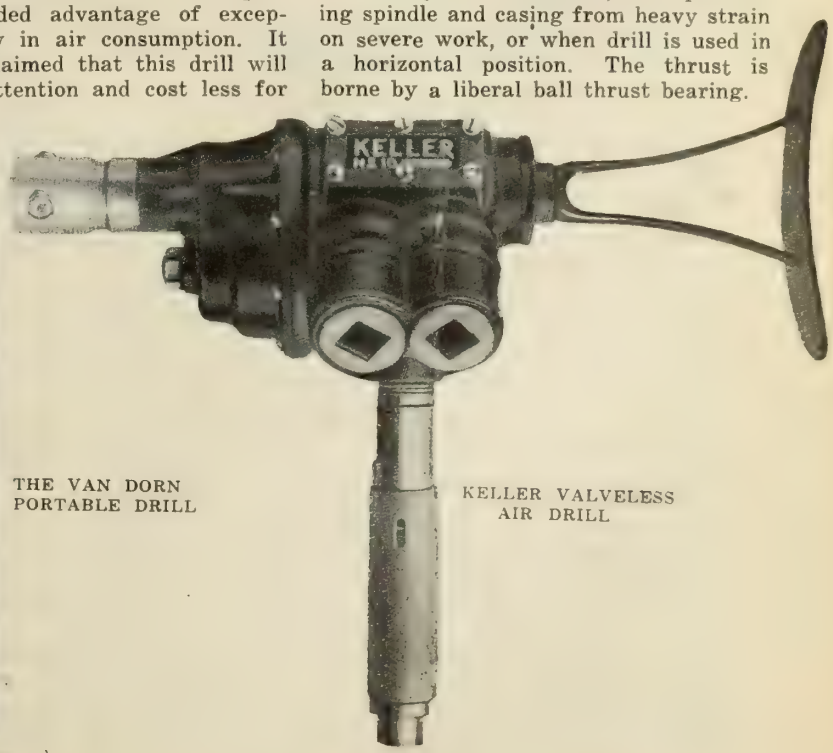
The connecting rods and pistons are made from Vanadium steel. The connecting rods are attached to the pistons by a ball and socket joint, secured by an ingenious locking device, which permits replacement of either the connecting rod or piston. In some drills the connecting rod is pressed into place, making it necessary to discard the complete assembly when making replacements.

The crank shaft is a drop forging, hardened and microground. It is amply large to prevent springing, mounted upon liberal sized annular ball bearings, insuring minimum amount of wear. The connecting rods are attached to the cranks by means of toggle joints secured with lock-nuts, which also serve to materially stiffen the rods.

The main gear is cut from a solid blank of high-grade steel, enclosed in a separate case, which, filled with grease, insures independent and permanent lubrication. The spindle bearing is extra long, with an additional bearing where it joins crankshaft, thus protecting spindle and casing from heavy strain on severe work, or when drill is used in a horizontal position. The thrust is borne by a liberal ball thrust bearing.



THE VAN DORN PORTABLE DRILL



KELLER VALVELESS AIR DRILL

The MacLean Publishing Company
LIMITED

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The Development of the Oil Engine

THAT the internal combustion engine is destined to take a very prominent place in future marine design, is becoming daily more apparent.

Repeated good performances of this type of motor are gradually overcoming the conservatism of shipbuilders and owners, and a striking instance of this is shown in the latest addition to the fleet of the Glenn Line, Ltd., Glasgow.

This company had already four vessels equipped with internal combustion engines, but the fifth, the "Glenapp," is larger and faster than any motor cargo ship hitherto built.

The "Glenapp," to which reference was made some time ago, is 470 feet over all by 56 feet beam, and moulded depth 36 feet 6 inches. Her gross tonnage is 7,260, so that her deadweight will be about 10,000 tons.

The engines, of the Burmeister & Wain type, built by Harland & Wolff, under license, are two in number, each developing 3,200 I.H.P. The B.H.P. is about 2,600. They are of the four-cycle type, eight cylinders to each engine. The speed is low, 125 rev. per min., the cylinders being 760 m.m. (about 30 ins.) bore and 1,100 m.m. (about 43⅜ in.) stroke. The fuel injection air is provided by a three-stage vertical air compressor on each engine, and there is an auxiliary air compressor driven by a 100 H.P. motor.

All the auxiliary machinery on deck and below is electrically driven, the current being supplied by three generators of the direct current type, running at 220 volts. Each of these is coupled direct to a 320 H.P. four-cycle Diesel engine, running at 210 R.P.M.

On a consumption of 24 tons of oil per 24 hours, including auxiliaries, a loaded speed of 13½ knots is maintained, and when light, 14½ knots.

The engine room staff consists of eight engineers, six greasers and three electricians.

Some people persist in looking on the oil engine as a passing fad, but every day brings proof of its ever-increasing use by far-seeing owners.

Our Mind is Relieved

IN the columns of the *Marine Journal*, of New York, there appears weekly some interesting reminiscences of the editor, Captain G. L. Norton.

In the issue of May 17th he speaks of receiving a visit from an old friend, now resident in Huntingdon, Quebec. This gentleman, a Mr. Millar, used to be chief engineer of the Morgan Line, and Capt. Norton hastens to reassure Mr. Millar's friends on a subject that has doubtless been causing them deep anxiety. We feel that it will also be interesting to Canadians, as showing them that at least some parts of our country approximate the high state of culture and civilization which is indigenous to the United States.

Capt. Norton's message to all Mr. Millar's old friends is that they will be pleased to know that "living so near the Empire State he has not been obliged to change his language, style of dress, nor habits, to conform to Canadian customs."

We congratulate Mr. Millar heartily. We have seen many visitors from our nearest neighbor who would have had to alter both their language and habits very considerably to conform to Canadian customs.

IT'S A caution what an interest some folks take in the tariff. The chap with a couple of heads of cabbage and a row of onions is powerfully concerned over the rate on agricultural implements.

* * *

THE real pleasure and lasting joy in business is not in gouging the public and making undue profits. The man or firm going through life with a dollar glued to the eye misses the best. "What can I do for you?" is a much better slogan than "What can I do you for?"



Educational Items for Future Officers

A Series of Questions and Answers on Subjects Pertaining to Seamanship—Rule of the Road—The Use of the Chart—These Articles Will Appear Monthly

Continued from last month's issue.

Compass Questions

Que.—What are the most particular parts of the compass?

Ans.—The magnets, cap, pivot and card.

Que.—How many points are there marked on the compass?

Ans.—The card is divided into 32 points and to complete the compass a lubber-line must be marked on the inside of the bowl to indicate the ship's head.

Que.—How many degrees are there on each point?

Ans.—Eleven and one-quarter.

Que.—How many degrees are there in the whole compass card?

Ans.—Three hundred and sixty.

Que.—What are the cardinal points of the compass?

Ans.—North, south, east and west.

Que.—What are the quadrantical points of the compass?

Ans.—North-east, south-east, south-west, north-west.

Que.—How would you box the compass?

Ans.—Sailor	Shoemaker.
N	Nail
N X E	Nail X Heel
N N E	Nail Nail Heel
N E X N	Nail Heel X Nail
N E	Nail Heel
N E X E	Nail Heel X Heel
E N E	Heel Nail Nail
E X N	Heel X Nail
E	Heel
E X S	Heel X Sole
E S E	Heel Sole Heel
S E X E	Sole Heel X Heel
S E	Sole Heel
S E X S	Sole Heel X Sole
S S E	Sole Sole Heel
S X E	Sole X Heel
S	Sole
S X W	Sole X Welt
S S W	Sole Sole Welt
S W X S	Sole Welt X Sole
S W	Sole Welt
S W X W	Sole Welt X Heel
W S W	Welt Sole Welt
W X S	Welt X Sole
W	Welt
W X N	Welt X Nail
W X W	Welt Nail Welt
N W X W	Nail Welt X Welt
N W	Nail Welt
N W X N	Nail Welt X Nail
N N W	Nail Nail Welt
N X W	Nail X Welt

Que.—What class of compass would you consider most suitable for our lake vessels?

Ans.—A liquid compass.

Que.—Why?

Ans.—The compass is generally placed in an iron box, termed a wheelhouse, at the forward end of the vessel. No one who knows anything regarding the laws of magnetism would ever expect the compass to be of any value as a navigating instrument in this position. This position, together with the weak construction of our lake vessels causing so much vibration, makes the dry compass of no value whatever, as it is very sensitive and susceptible to magnetic variations.

Que.—How many magnets should be placed under the card of an efficient compass?

Ans.—Not less than two, not more than six.

Que.—What angle should the ends of these magnets rest at, with reference to each other.

Ans.—Sixty degrees.

Que.—What size of compass would you use on board your vessel?

Ans.—The larger it is the better it is to steer by, but the smaller it is the more correctly it will point. Taking these two items into consideration, an eighth-inch compass

should be as serviceable as any, on our larger vessels, and a four or six-inch on tugs or smaller craft.

Que.—How far should your compass be placed away from iron?

Ans.—Not less than seven feet; if the compass is placed closer it should not be depended upon, as the deviation may change considerably at any time, and getting on toward the end of navigation, when the weather gets cold, causing the iron in the vessel to contract, you must expect the deviation to change considerably from what it had been during the summer months.

Rule of the Road

Que.—Repeat the verse which alludes to steamers crossing.

Ans.—If to your starboard **red** appear,
It is your duty to keep clear:
To act as judgment says is proper,
To port or starboard, back or stop her.

But when upon your port is seen
A steamer's starboard light of **green**,
There's not much for you to do,
For **green** to port keeps clear of you.

Que.—Two sailing vessels going with the wind on the same side, which keeps out of the way?

Ans.—The sailing vessel to **windward** keeps out of the way of the sailing vessel to **leeward.**

Que.—A sailing vessel braced up on the **port** tack meets another braced upon the **starboard** tack. Which keeps out the way?

Ans.—The sailing vessel with the wind free on the **port** side keeps out of the way of the vessel running with the wind free on the **starboard** side.

Que.—When is a vessel supposed to be under way according to the rule of the road?

Ans.—When she is not at **anchor**, or made fast to the **shore**, or **aground.**

Que.—When are vessels to carry their sidelights and masthead lights?

Ans.—From sunset to sunrise in all weathers when they are making way through the water.

Que.—How is a small vessel to carry her lights in bad weather?

Ans.—They must have them lighted and ready for use, so that on the approach of or to another vessel they can be exhibited in sufficient time to prevent collision, and the outside of the lantern shall be painted the color of the light it contains, and great care should be taken not to exhibit the **green** light on the **port** side nor the **red** light on the **starboard** side.

Que.—State the rule for two steamships passing.

Ans.—**Green** to **green** and **red** to **red**, perfect safety to go ahead.

Que.—What is the rule for steamers navigating narrow channels?

Ans.—In narrow channels every steamship shall, when it is safe and practical, keep to that side of the fair way or midchannel which lies on her own **starboard** side.

In all narrow channels where there is a current and in the rivers St. Mary, St. Clair, Detroit, Niagara, and St. Lawrence, when two steamers are **meeting**, the **descending** steamer shall have the right of way and shall, before she has arrived within the distance of half a mile of the other vessel, give the signal necessary to indicate which side she intends to take.

Que.—What is the meaning of a prolonged blast, what does it indicate?

Ans.—A steam vessel is making way through the water, indicating **fog, mist, falling snow**, or **heavy rain storms**, and that I am proceeding with caution.

Questions For June Number

Que.—How can you tell if your compass is sitting parallel with the keel of your vessel?

Que.—How would you know whether it should be moved to the right left to make it parallel with the keel?

Que.—What is the first mate's duty aboard his vessel?

Que.—When relieving the watch at night what should be the officer's first duty?

An Engineer's Bravery

HIS Majesty the King has been pleased, on the recommendation of the President of the Board of Trade, to award the silver medal for gallantry in saving life at sea to Mr. William Harper Ritchie, formerly chief engineer of the steamship "Ben Nevis," of Glasgow.

On the 1st of October, 1917, while the S.S. "Ben Nevis" was lying off Immingham, a fire broke out in the starboard bunker. Mr. Ritchie went down through the coal in the 'tween decks into the lower bunker, where he located the fire. A fire hose was passed down to him and he remained down in the bunker working the hose for about three hours, until the fire was extinguished.

Mr. Ritchie had great difficulty in working his way to the seat of the fire, and incurred grave risk of suffocation owing to the smoke and fumes, beside the danger of being buried under the coal which ran down from time to time.

Had the fire not been extinguished, there would probably have been an explosion, attended with serious loss of life, as the cargo consisted of explosives and general munitions of war.

The Question of Oil Supplies

THE securing of an adequate supply of oil fuel is going to be a subject of anxiety to several countries in the near future.

The United States Shipping Board under Mr. Hurley's guidance, seems to be committed to a policy of rejecting steam in favor of oil engines, and even where the steam engine is retained, the fuel burned is oil instead of coal. It is not long since the secretary of the United States navy issued a warning regarding the use of oil, and stated the necessity of conservation in order to ensure a sufficient supply for their navy. As a matter of fact the United States are already importing an appreciable portion of their oil from outside sources, chiefly Latin America.

Great Britain also is deeply concerned in finding new supplies of oil. There is within the Empire but a small amount, contained in the oil fields of Burmah and Trinidad. There is of course the Anglo Persian Oil Company, which is under purely British control, but is not within the Empire. Whether the present search for oil in England will result in the discovery of an adequate supply is still in the lap of the gods, though the indications are favorable.

The general adoption of oil fuel and oil burning engines will necessitate the multiplying of oil depots on all the great trade routes, and the country that controls the largest amount of oil is going to be in the most favorable position. If there were the same resources in oil within the British Empire as there are of coal, our economical supremacy would be practically assured.

The Careful Justice

SENATOR LODGE dropped in on a boyhood friend when visiting in a rural district.

While they were chatting a couple came in to be married. The Justice married the pair after accepting a moderate fee, and before they went out handed the bride an umbrella. Lodge observed the proceeding with solemn interest, but after the couple had gone, he said: "Do you always do that, Arthur?"

"Marry them? Oh, yes, if they have a license."

"No, I mean give the bride a present?"

"A present? Why, wasn't that her umbrella?"

"No," said Lodge peevishly, "It was mine."

A Chapter on History of the Mariners' Compass

This, the Greatest Aid to Navigation Known to the Sailor, Developed From Very Crude Beginning—The Date of Its Invention Lost in the Remote Past—Compass Variation

IN this chapter we will take up the study of the mariner's compass. All the data available have been gathered together, and has proved interesting in the gathering, so should prove as much so in the disseminating. "Great oaks from little acorns grow," and this is very true in the field of invention, as shown by the development of the electric telegraph, the telephone, and the wireless, and not least with the mariner's compass. This instrument, developed from crude beginnings, has been the greatest single aid to navigation ever discovered. Other things have, of course, been developed, which in conjunction with the intelligence of man in command, have contributed greatly to the safety of the seas. In the early days of navigation the sailor depended entirely on the sun, moon and stars for guidance. Naturally these were only available in clear weather, therefore his journeys were confined to the immediate neighborhood of the shores. Did he venture far away, and the skies become overcast, he was hopelessly lost, so navigation was confined to very narrow limits, and a trip across Lake Superior or any corresponding body of water was considered a great undertaking. These were the days when Europe, Asia, Africa and the immediately adjacent island constituted the known world.

The greatest of the earlier undertakings, we are told by authorities, was the circumnavigation of Africa by Necho Sataspes and Hanno, which was looked upon by their contemporaries as a wonderful feat. Comparing their state with ours of the present day, in aids to navigation, we may well give these early navigators our meed of admiration.

The discovery of magnetism, and its application to the mariner's compass, led to a great advance in the science of navigation, and to a much wider knowledge of the world's geography.

The lode stone, a dark-colored iron ore found in various parts of the world, is a natural magnet. If small pieces of iron or steel, such as a needle, are brought near to it, they will be drawn to it and held by its power of attraction. If a piece of lode stone be fastened to a cork floating on the surface of a basin of water, it will in a short time come to rest with its extremities pointing in a north and south direction. In the middle of the thirteenth century, when this magnet was introduced into Europe, it was all that was known of the present-day compass. Imagine, if you can, our present-day navigators equipped with only this instrument, crude and inaccurate. Most of us would be inclined to throw it overboard, and use some other means to find our way around. Yet in those days the intrepid navigators sallied forth and sailed hundreds of miles from land, with perfect confidence.

There have been many claimants for the honor of having invented the compass, but the name of the real inventor is clouded in obscurity. The Chinese claim the honor of having been the discoverers, and may be right. If we take a steel bar, and starting from the centre of it, draw the north pole of a magnet towards one extremity, several times, and then starting again from the centre, draw the south pole of the magnet to the opposite extremity in the same manner, the bar will become magnetized. If it now is placed upon a frictionless bearing point, it will vibrate on the point, and ultimately settle in a north and south direction. This is the principle on which the construction of the compass is based. The greatest scientific mariners have not been able to explain all the wonders of magnetism. It bears a great resemblance to electricity, and in one sense it is quite probable that it may be but a modification of that force. Like electricity it cannot be weighed, or seen, and has the same faculty of impregnating various bodies. As explained in previous talks, if the north pole of one magnet be placed near the north pole of another magnet they will repel each other, but if the north and south poles of two different magnets be placed near each other they will be drawn together.

This is similar to the positive and negative states of electricity and may govern by the same law, "Like poles repel each other and unlike poles attract each other."

The earth itself is supposed to be a great natural magnet, as I have told you from time to time; and the attractive influence of its magnetic poles, which are situated a short distance from the geographical poles, are supposed to give the direction of the magnetic needle. In reading of Captain Edward Peary's great voyage of discovery in the Arctic he says he came upon a certain spot in the north-western extremities of Baffin's Bay, about 20 degrees or 1,200 nautical miles from the true geographical poles, where the magnetic needle, which had been varying to an extreme degree for some time, swung absolutely half round the compass and pointed due south. It continued to point thus as he sailed north or onto the north, and therefore the spot where the change was made was denominated the North Magnetic Pole. The magnetic poles are never stationary, but are ever varying to the east and west and back again in long periods of time.

There are two lines on the earth's surface passing irregularly from north to south, one through America and the other across the Eastern Continent, where there is no variation of the needle. East or west of these lines the variations are sometimes considerable. The needle is also subject to daily and yearly variations and in order to become a good navigator these must be understood and that is the point we are now arriving at. We all know perhaps that Christopher Columbus was supposed to have a mine of geographical knowledge. It was said that he had studied much and had a theory of his own. Like a great many more of us, he believed the world to be round, and that a passage could be made to India by way of the Western or Atlantic Ocean. This theory was jeered at by the thoughtless and ignorant, but Columbus was not to be set aside by the scorn of the populace. Though without money, and even lacking the confidence of the people, he took his case to the King and Queen of Spain. They helped him to the extent of procuring three small vessels, fitting them out and placing them at his disposal. The expedition sailed from the shores of Spain on the 3rd August, 1492, the only navigating instrument on board being the floating compass. The compass card, with its 32 divisions or points, was evidently not in use on the vessels of the expedition, though the points were known as early as 1391, the Dutch claiming the distinction of having added the card to the compass.

The undertaking was a bold one, and many people considered it a foolish one and never expected to see either Columbus or his crew again.

As they sailed on, day succeeding day in unvarying monotony, and provisions running low, the crew became discouraged, and tried to persuade their leader to return. At this juncture a circumstance arose that added to their alarm in a considerable degree. This was the fact of the compass needle no longer pointing to the north. Again the crew appealed to Columbus to turn back, and when he refused, planned to get rid of him and take matters into their own hands. However, by appeal and expostulation Columbus prevailed on his men to continue for a few days longer, and was rewarded by sighting land on the morning of the 12th October, and a little later landed on San Salvador. He believed he had reached India and he gave the inhabitants the name of Indians. He returned to Europe and received the welcome plaudits of the world. His opinions, which had been denounced as foolish and visionary, were demonstrated

to mankind as established facts, and civilization was to advance with rapid strides. Such was the great triumph of the mariner's compass, and had it not been for that simple instrument America might at this hour have been a howling wilderness, and the true shape of the world unknown.

Since Columbus' time improvements of every description have been made to the mariner's compass and the magnetic needle of to-day is so delicately constructed and so perfectly poised that fractions of a degree of a circle can be measured with accuracy when half points could hardly be reckoned by the old-time card compass.

From the floating compass the magnetic needle was balanced upon a steel pivot, in a circular box containing a card, upon which the different points of the compass were marked. This kind of compass is called the "dry card" because it has not flotation power—a liquid to erpvent the card from flying round in a seaway. Even this kind of compass was a rude instrument compared with the compass of the present time.

As a rule these compasses worked slow and were sluggish, owing to the great amount of friction on the bearing point, caused by the heavy weight of the magnet and other appendages of the card. This friction on the bearing point was both injurious in respect to steadiness and detrimental in blunting it or boring into the cap, and for this reason such a compass soon became defective.

Who has not seen a piece of marlin or spun yarn made fast to the bowl of a dry compass, and occasionally twitched by the man at the wheel to "keep the card alive," or, as it is termed in Jack's phraseology, "to keep the compass afloat?"

There are quite a number of card compasses, of old style, in existence and doing service to-day. They will be found in some of the old-time schooners of the lake "mosquito fleet." It may be said that they are of little use and but little reliance can be placed on them.

It must not be supposed from this that the dry card compass is obsolete and out of date; the kind just mentioned is, but the finest compass made in the world to-day is the dry kind, invented by the late Lord Kelvin.

In constructing this compass Lord Kelvin came to the conclusion that no weight was in any case to be added beyond that which was necessary for supporting the card, and that to accomplish this a plurality of short needles were to be used, whereby greater surface is secured than would be the case were the same amount of material used in a lesser number of needles of the same length.

Manufacturers of compasses at that time were of the opinion that in order to gain steadiness in a seaway, it was to be obtained by heaviness of needles and compass card. This is not true. Thus if the addition of weight to the compass card improves it in respect to steadiness in a seaway, it is not because of the additional friction on the bearing point that this improvement is obtained; on the contrary, the dullness of the bearing point, or too much weight upon it, renders the compass less steady at sea, and at the same time, less decided in showing changes of the ship's head than it would be were the point perfectly fine and the friction reduced to the minimum. It is by increasing the vibrational period that the addition of weight gives steadiness to the compass. The vibrational period, or the period of time of a compass, is the time it takes to perform a complete vibration when deflected horizontally through any angle not exceeding 40 degrees and left to itself to vibrate slowly. This is more fully explained when considering magnetism.

If weight were to be added to produce steadiness the place to add it would be at the very circumference of the card, by which means it would require a large amount of inertia, depending upon the extended radius of gyration. (Gyration, the act of turning or whirling as around a fixed centre. The radius of gyration is the distance between the axis of a rotating body and its centre of gyration.) All of these points have been embodied in the Lord Kelvin compass.

Before tracing the history of the compass, which although simple from a mechanical point of view, is wonderful as a phenomenon, let us understand that it consists only of a magnetized flat bar or needle of steel, riveted to a circular card, on which 32 equal lines are shown radiating from the centre, and indicating the various compass points of the horizon. This card is balanced on a sharp steel point, and rests in a horizontal position, preserving the same when the vessel pitches and rolls, and being poised to turn freely, it always points out the magnetic cardinal directions, provided that disturbing influences in the way of iron and steel are not brought in near proximity to it. In other words, the compass card will remain fixed while the vessel revolves beneath it.

Let us consider briefly the reason for the constancy of the needle to the north point of the heavens.

The earth is a huge magnet, and has a north and south magnetic pole. An iron bar acquires polarity by magnetism, and when freely suspended from its centre of gravity (either by a thread or by being poised on a sharp point), it will arrange itself in the magnetic meridian and point to the magnetic poles of the earth. These magnetic poles are respectively the points on the earth toward which the magnetic needle directs itself, or where the intensity of the magnetic force is a maximum, and above which the dipping needle (an instrument consisting of a magnetic steel bar suspended in the horizontal plane), will assume a vertical position, or, in other words, the end will point up and down.

A magnetic chart shows two lines, called "lines of no vibration," which extend from the magnetic poles. At all places on these lines the magnetic and true meridians coincide, and, as a consequence, all compasses on these two lines will point true north (defined by the Pole Star), provided deviation does not exist in the compass.

One of these lines passes from the north magnetic pole through the Capitol at Washington, through Charleston, S.C., the Windward West India Islands, the eastern part of Brazil, and continues on through the South Atlantic Ocean. Looking towards the north, westerly variation exists on the right-hand or easterly side of this "line of vibration," and easterly variation exists on the left or westerly side.

The other line of no variation passes through northern Europe, the middle of the Indian Ocean, the western part of Australia, and continues on south of that continent.

The North Star (Polaris) may be accepted for all practical compass purposes as the true north, for its greatest divergence is only 1¼° from the geographical pole, or about the eleventh part of one point of the compass. Twice in every 24 hours the North Star bears to true north, then for 6 hours it recedes or moves sideways, until it bears N. 1¼° E. or N. 1¼° W. It then approaches the pole for 6 hours, at the end of which time it is on the meridian again, and bears true north.

Of course, it is the earth's motion that gives an apparent movement to the star, as the latter is fixed. It is this revolution of the earth that seems to give an orbit to the Pole Star, the radius of which orbit is about 1¼° from the pole. When the Pole Star is between (intercepts) the observer and the north pole, or when the north pole is between the observer and the Pole Star, then in both cases, the star is on the meridian of the observer and bears positively true north. As has been explained, however, the North Star varies so little at all times from the true north that it may always be accepted as indicating the geographical pole of the heavens.

Now let us appreciate an interesting fact, which may at first serve to puzzle some readers.

The compass is never expected to point true north, or to the North Star, unless the ship is on the line of no variation, otherwise the compass is out owing to deviation.

(To be continued)

Montreal.—The Canadian Ranger is on the Atlantic, making her initial voyage. She has a full cargo, and the freight earned will be $150,000 for the trip. The Canadian Ranger is the fourth of the Canada Government fleet of cargo vessels. A party of newspaper men were invited to make the trip from Quebec to Murray Bay on the vessel, and they spoke in high terms of the vessel and her crew. The Canadian Pioneer is now on a voyage to Buenos Aires, and the Canadian Warrior on a trip to the West Indies and Cuba, so that the Canadian flag is beginning to appear in the mercantile highways of the sea.

DISCHARGE BOOK FOR GUILD MEMBERS

In future a discharge book will be issued to members of the Canadian Merchant Service Guild, to assist them in getting employment.

The member, on joining his vessel, should hand the book over to the master or chief engineer, who will retain the same until the member is leaving, or being discharged, then the necessary items will be filled in with ink, without prejudice, and the book handed to its owner.

When looking for a new position the member should hand his book to the master or engineer for inspection, as it will at once show the applicant's efficiency in his last position. Members will find this will greatly assist them in getting employment. A receptacle will be found inside the cover to hold the membership card. If masters, officers and engineers will assist in carrying out the details of this proposition, the executive of the C.M.S.G. will know they shall soon have a body of men behind them who will create the unity and strength necessary to carry out whatever problems they may consider to the best interests of themselves and the Mercantile Marine profession of Canada.

We should not forget that when our vessels leave port, their officers and crews must become the representatives of those who invest money in the venture. It is to our seamen the people of Canada must entrust the progress and prosperity of our international trade under the red ensign and maple leaf.

For these reasons our seamen must realize that their position and responsibility places them in a class by themselves, and to mix up with labor unions or organizations of that kind would be a fatal step, both to them and to Canada. It is the duty of our seamen to cooperate with their employers and do all in their power to enable our shipping interests to compete with the outside world.

This does not mean that they should not receive monetary remuneration in accordance with their position and responsibility on board their vessels, but it does mean that only through organization and unity can they give that co-operation and assistance, which will make them of far greater value to those who invest money in ships. When this spirit of unity and co-operation asserts itself, there will be no question of our seamen receiving whatever reasonable request or benefit they may ask for, and no one will be more ready or willing to assist them than the Government or their employers.

It is with these aims in view this discharge book is being prepared, so that it may assist those who are already members to bring discipline and efficiency to their profession. These principles must be produced before a sure foundation can be laid on which, with confidence, the work of building up our Mercantile Marine can proceed.

Do the masters and officers understand that they are, and must be, the leaders of our seamen, and to a very great extent the future of their profession must depend on what is inculcated into the minds of our younger seamen by the masters and officers of to-day. Bearing this in mind, is it not incumbent on these masters and officers when building up their profession, to commence at the bottom and not half-way up? In other words, see that the cabin-boy gets his share of whatever may be considered necessary to the welfare of the profession and those actively engaged in it, otherwise your building must collapse, and you shall be tangled up in its ruins.

We must remind our seamen that this discharge book is being issued for the benefit of C.M.S.G. members only, therefore, it can have no bearing whatever on the requirements for examination as laid down by the Department at Ottawa.

This book is nicely finished in cloth cover and will cost the C.M.S.G. 50c each to manufacture. It will be on hand June 1st and we would ask members in good standing to assist in defraying this expense by sending in their rotation number and fifty cents, and then the book will be sent to any address they may give.

No seamen, who is affiliated in any way whatsoever with labor unions, need apply for this book or membership in the Guild, as the C.M.S.G. considers our Mercantile Marine of such great importance to Canada and her people that it will never allow the progress and prosperity of that profession to be interfered with by such organizations.

W. INKSTER,
Sec.-Treas. C.M.S.G. Central Section.

AMALGAMATION

Members of the C.M.S.G. will be interested to know that there is an institution under the same name in British Columbia and an institution run on the same basis in Halifax under the name of the Masters' and Mates' Association.

Arrangements are now being made to put the three into one, by dividing the Dominion into three sections, west, central and east, with a constitution to cover the whole, each section having their own by-laws and doing their own financing, as may be considered to the best interests of the section they are operating.

This cannot fail to give the co-operation, unity and strength which never has been attained before by an institution of the kind in Canada, and should go a long way to putting our seamen in a position to see that the laws, rules and regulations and conditions under which they must carry on the profession shall be formulated to give the best results to themselves and the mercantile marine profession of Canada.

W. INKSTER,
Sec. Central Section.

CANADIAN SARDINE FISHERS' PLIGHT

About 2,000 bread-winners in the sardine fishery industry on our Atlantic coast are faced with unemployment. The fishing season normally opens on May 1st, but owing to the fact that the factories have a large surplus from last year it is not the intention of the managements to open until that is disposed of. The enormous stocks of similarly canned fish in Europe and the United States quite prevent even the hope of export of the Canadian maritime produce, but the Trade Commission is confident when the facts are brought before the public they will exercise that collective patriotic influence which solved similar temporary difficulties in the vegetable and fruit season last fall.

The number of fishermen engaged in catching Canadian sardines is about 1,200, and there are in addition 600 cannery employees, for the most part women and girls.

SALT WATER FAR INLAND

Salt water has been found in a large proportion of the wells sunk to a depth of 1,000 feet, hundreds of miles from an ocean. According to a report sent out by the United States Geological Survey, the presence of a body of salt water so far inland is due to the fact that it is generally contained in some bed of unusually porous rock, and is nothing less than the remains of a prehistoric ocean entombed among the strata.

In some of these wells the flow of salt water is so strong that the drillers think they have struck the Gulf of Mexico, or some other larger salt water body.

How did this salt water get into the porous rock? Has the rainwater soaked so far down in the earth it has struck a salt bed and dissolved it, thus becoming salty, or had the salt water some source far within the earth from which it has arisen toward the surface; or is it the water of some ancient ocean, which has gradually been buried under sand and mud?

The shells of sea animals found in the limestone rocks at the heart of the continent show clearly that at one time in the remote ages the ocean covered a large part of this country, and it appears probable that the salt water is really fossil water entombed in the sand and mud of former oceans and now brought to the surface by the drills which are sent to great depths.

This salt water is found especially near oil fields, but has been struck by a drill at many other places. „

NOBLE MARINERS

Miss Softleigh (watching revolving light of the lighthouse):—"How patient the sailors are."

Coast Guard:—"Patient?"

Miss Softleigh:—"The wind has blown the light out six times and they keep on lighting it again."

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

A TALK ON ANCHOR WORK

A GREAT many important duties come into play when a vessel is at anchor. The disciplined atmosphere that enters into seamanship and navigational work whilst the ship is at sea occasionally vanishes when the "hook" is dropped and the main engines are rung off. This is not as it should be, for a vessel can incur all kinds of damage and expense in a roadstead, or even when moored to a dock.

Anchor Watch Duties

A high order of intelligence is required from any junior officer or petty officer who may be temporarily in charge of a vessel at anchor and the throwing of this responsibility on a man who is purely a watchman, and not a trained seaman, is jeopardizing your ship.

Whoever may be trusted with the deck should thoroughly understand how to use the lead, feel the cable, and keep tab on the bearings, if such can be had. An intimate knowledge of the windlass is also essential. Fancy a ship helping herself to a few fathoms of chain (which is not an unusual affair), or swinging dangerously near another craft or object, when the anchor watch cannot act to arrest or avoid such things through his lack of knowledge of brakes, gypsies, cable nuts, or riding shoes. Of course, you say that you would call someone higher up if such things happened. Quite true and right, but the anchor watch can often save a blue situation by having the precautionary work half done by the time his superior gets on deck.

Changes of wind, sea and tide, the departing and arrival of other vessels and such items must be noted too. If another vessel fouls you or your anchored position, a seamanlike narration of the event by the anchor watch has a greater effect on a marine investigation than an ordinary lawyer has.

Other important things that call for attention are the regulation lights, fog bells, trimming of ventilator cowls away from spray and rain, and the policing of the vessel against harbor "sharks" of a nefarious character. In some open roadsteads these brazen ship thieves have actually stripped vessels of everything movable, while the anchor watch slept. This class of gentry are well armed, and the writer has exchanged shots with them in two of the world's greatest anchorages, Valparaiso and Rio de Janeiro.

Where the anchor watch is composed of one seaman—each taking an hour of the night, or two hours—it is well to insist that the reliefs must be made on deck, not in the mess-room or sleeping quarters. No real sailor would stand for that, but such procedure creeps in occasionally, so always keep your weather eye open for the culprits.

Tropical Diseases

As the Canadian merchantmen cover the foreign routes they will sometime or other find themselves in ports where malaria, yellow fever and typhoidal diseases are at work. If at anchor in such places, remember to have a good hose and broom service at work when the muddy chain is coming on board at time of departure. Many a vessel that has foolishly stowed away a dirty cable from such ports has simply filled the chain locker with the germs of horrible diseases and their crews have been stricken with fevers long after the contaminated coast was below the horizon. Numerous anchorages have foul ground through sewage outlets near the shipping. Those who ever had the "pleasure" of laying at anchor in the famous Boca of Rio de Janeiro, or who have seen with their own eyes the coolie corpses decorating the muddy banks of the Hoogli, understand how easy it is to bring foul diseases on board with the anchor cable.

Gangway

Gangway duties alongside of a dock are in many ways related and similar to anchor watch work, therefore a little can be said about them

A gangway man should understand the uses of the different moorings, so that he can with intelligence ease or heave in a breast rope, head or stern line, or handle springs. Springs have a counter direction to head or stern lines and are most serviceable when spread from low deck pipes.

In non-tidal harbors the mooring problem is not so important, but even there the vessel is either rising or falling through cargo or ballast manipulation and needs sailor-like attention.

Aground at Dock

In some berths a vessel may go aground. This is easily noticed by a vigilant deck watch by the air bubbles coming up alongside and the moorings straining with the heel or cant of the vessel.

The chief mate should be notified, as he may have details of the berth from the harbor master. In some cases it is imprudent to go on loading or discharging where the ship has taken the ground, but the mate or skipper will decide on matters of that kind. It is never amiss for the gangway man or junior mate, however, to take soundings right around the ship and ascertain the nature of the ground, etc.

At some docks a deck watch must have one man on gangway duty alone, as it is important that he address everyone who wishes to come on board. Where passengers or women and children visitors are concerned, little courtesies in regard to safety are never amiss. Again, an outstretched hand or to lift a child in your arms, where timidity has arrested its motion, is only a part of British sea chivalry, and don't forget it.

In lonely docks a gangway man should have a heaving line and life-buoy handy, as well as a lamp and Jacob's ladder. In case of fire or accident don't be backward in the dead of night to haul everybody out of their bunks. No apologies need be given; make all the noise you can.

Whether at anchor in a bay or fast to a dock use plenty of the common-sense that makes any young sailor understand that life on board ship is a life of watching, watching, and more watching.

The Anchor in Practice

It might be well to state here that the common-garden tramp steamer must of necessity find itself in many anchorages and roadsteads, where pilotage or local help is a minus quantity, and therefore the skippers and mates have to use their own initiative in anchor manoeuvres. I mention this as it has long been a faulty belief amongst a section of our inland waters seamen and officers that in foreign trades the average skipper or mate faints when the land heaves in sight, and only comes back to normal when a pilot pats him on the back. Of course, to some Canadian seamen who have been abroad the real conditions are well known, and while the underwriters and harbor authorities generally compel all vessels to take the services of river and dock pilots, the average man who sculls his ship in and out of the Baltic, Black Sea and European coasting routes, to say nothing of Magellan waters down Cape Horn way, and the Great Barrier reefs of Australia, etc., seldom see a pilot until he can jump ashore, and the real intricate navigation is over.

We are entering a strange anchorage to await pratique. If other craft are already there then your location is picked for you. If you are alone, which is a common thing, then put the leadsman in the weather chains or gangway and make the last three or four miles under easy steaming. Should you possess a large scale chart of the roadstead, have it on the bridge for purposes of scrutiny. If you are depending on an ordinary coast sheet then jot down on a piece of paper the approximate bearings of some landmarks which you can distinguish from chart interpretation and feel your way in. Sometimes a practical aid to the anchorage will be marked on the chart

thus: "Do not anchor west of spar buoy as ground is foul."

Q. What unthought-of danger might exist in any such harbor, which the chart might not enlighten you about?

A. A recent wreck, awash or submerged.

Q. What marks such objects,

A. A green buoy in common practice, but a light-ship with yard-arm signals in river or in heavy traffic.

Q. What other things would require special procedure?

A. Avoiding to anchor near a telegraphic cable and taking an outside berth if you had explosives on board.

Some patent anchors need to be hove out of hawse pipe with reversed windlass, while some will slide out by easing the cable nut or brake. At any rate, always have the crown of your anchor almost awash and after the ship has stopped or begun to gather sternway the "old man" will shout "let go." Never be generous with a windlass brake. and then expect to stop the chain dead; the stresses are too great for rough handling. Say that you anchored in ten fathoms, the thirty fathom shackle between hawse pipe and water would be ample for quiet weather. The cable is made up of fifteen fathom lots, so the shackles run 15, 30, 45, 60 and so on. The round end of shackle enters the water first. Some mates have the shackles painted different colors, others have them marked with wire, while a few officers expect the carpenter to keep count of the shackles as they roll over the gypsy.

Whilst at anchor your ship will be governed in her behaviour by wind and tide, singly or together. If opportunity favors it, get a complete table of deviations where swinging is indulged in. How would you go about this?

A. By choosing two conspicuous objects which are in line with each other. Put the parallel rulers over the objects on the chart and find their magnetic bearing from the nearest compass rose. Then as your ship swings take the compass bearing of the objects in line for each point of the circle. The difference between the compass bearings and the magnetic bearing found on chart is your deviation.

Q. If you had taken the true bearing of the two objects, what would the difference have been?

A. The error—variation and deviation combined.

Ebb and Flood Anchorages

If you come to a single anchor in a narrow river where it would be dangerous to swing on a big radius at change of tides, make sure that you "heave short" at slack water and "pay out" again when swung to the next tide. This precaution also prevents slack cable from fouling the anchor, as vessel describes half circles twice daily.

Should your vessel become wild riding in a tideway and constantly break her sheer, first try taming her with the helm. This cure depends on her draught and the velocity of the tide. Ships which are heavily by the stern are most awkward to handle at anchor. Give her a little helm on the side she is fondest of and perhaps she will stay quiet. Failing the rudder medicine, heave in, say, two shackles and drop the second hook. Each anchor should bear from the ship's head about two points on the respective bows. If your stay at single anchor was temporary, however, put your best helmsman at the wheel and keep the crazy craft straight by steering, thus avoid dropping the second anchor. It is not safe to put much rudder across a single anchor vessel if tide is running more than four miles an hour, as she is inclined to swing abreast of her hook instead of ride astern of it.

Turns in the Chain

Where you must ride to two anchors the question of turns in the chains comes in for examination. The more you tend ship at times of swinging the clearer hawse you will have when the moment of departure comes.

Say that your ship answers to the first tide and swings 16 points. What happens to the cables? She puts a cross in them. Now when she wants to answer to the second swing try and persuade her to take that cross out. Should you fail to do that, she will put a round turn in the chains. If you had to get under way in such a predicament, it would mean unshackling one cable at the nearest shackle and dipping it under the other chain over the bows, a long, ugly and irritable job with a hot-tempered skipper within hail. Of course, the most watchful mates in the world have had to take turns out of anchor chains once in a while.

Should you have the misfortune to be up against such a job, make sure that you dip the chain that she is not putting strain on. Use a wire or rope hawser to hang off the dipping cable. Where a "frapping" or close lashing of the two chains is used in the ordeal, don't allow the lashing to be taken adrift in the ordinary way. It is far better to let the carpenter chop it adrift with an axe, for while you lose the value of the rope you often save a man's life or arms. In such roadsteads as Valparaiso the water is so deep that a steam barge is used for clearing ship's hawses, but that is the exception and not the rule.

Another Two-Anchor System

Having spoken of the two-anchor business where the hooks lie ahead with little spread, we must now view the other way of using two anchors, viz., the ebb and flood moorings. In this case the ebb anchor lies ahead when the flood hook is out on the opposite beam, and when your ship swings the anchor, which has been loafing, takes up duty, while the other one hangs its slack chain on the bottom. The diagrams speak more forcibly than I can write about it. This method insures small swing.

The kedge has lost a lot of its romance with the going of the sailing ship, but it is nevertheless a faithful servant on many a steamboat. While windjammers pulled themselves from outer to inner harbors with the kedge and a 3-in. rope, the tramp steamer sometimes falls back on this handy little anchor for an off-shore mooring for her quarter. The lack of dock wall sometimes makes it imperative to hold a ship in deep enough water to suit her draught, by means of poles or booms from the river bank to the vessel's rail or side. In such and similar cases a kedge is run out from the off-shore quarter and that warp looks after the stern, while an off-shore buoy-rope or bow anchor looks after the vessel's head. Kedge anchors can be easily carried out in a ship's life-boat or a barge. Again, they can be dropped before the ship is hove in to the berth.

With the use of the propeller and a trustworthy kedge a good-sized tramp can be sometimes dragged off a shoal or sandbar, so don't forget to make use of this baby anchor when necessity dictates.

Anchor Buoys

In some harbors it is the custom to have anchors buoyed, thus preventing other craft from fouling your ground moorings. Make sure of the depth you are to anchor in, and with allowance for range of rise and fall of tide you can gauge the length of your buoy rope. A piece of wooden fender makes a good buoy. Make fast the buoy rope to the crown of an old-fashioned hook, but to the shank ring of a stockless anchor. Where you wish to make your buoys conspicuous, flag them with bamboos and old bunting.

Vessels riding in a tideway behave best when about an even keel, whilst craft which are riding to wind and sea keep a pretty true position if a little by the head.

A ballasted ship high out of the water forward is the worst proposition at anchor. In heavy weather, nothing short of two anchors and all the chain will hold her.

On Dragging

There are several ways of knowing whether your ship is dragging her anchors. At night cross bearings of lights on shore are a trustworthy thing to go by. Bearings with angles from seventy to a hundred degrees are the quickest tell-tales. With smaller angles the ship can drift or drag considerably without you noticing it. After your bearings are well taken, should they change more than two or three degrees, investigate. It is possible for the bearings to change a little owing to the vessel altering her head in azimuth, and hence slightly affecting the bearings as the deviations change on the ship's head.

Another way is to have the heaviest sounding lead thrown out abeam clear of the ship's side. Give a little loose line and make fast to the rail. If she drags, the line will eventually trend in a head direction and be taut. Still another and most interesting way, especially on a dark and windy night, when no shore lights can be seen and when sea poundage makes the feel of the lead out of the question.

To be continued

Work in Progress in Canadian Shipyards

A Record of Work Recently Completed or in Process of Completion — Principal Features of Specification—Approximate Launching Dates—Vessels on Order

BRITISH COLUMBIA

YARROWS, LIMITED, ESQUIMALT, B.C.
Occupied on marine repairs and marine castings.

H. VOLLMERS, NANAIMO, B.C.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.
Building five wooden steamers for French Government. Three of 3,500 tons for Belgian interests.

B.C. CONSTRUCTION & ENG. CO., POPLAR ISLAND, NEW WESTMINSTER, B.C.
Four wooden vessels, 1,800 gr. tons, 2,800 tons d.w.

NEW WESTMINSTER MARINE CO., FT. OF FURNESS ST., NEW WESTMINSTER, B.C.

STAR SHIPYARD CO., NEW WESTMINSTER, B.C.

J. A. CROLL, PORT ALBERNI, B.C.

PACIFIC CONSTRUCTION COMPANY, COQUITLAM, B.C.
"Eirini," 2,800 tons d. w., for Greek interests, completed April, 1919.

C. E. BAINTER, PRINCE RUPERT, B.C.
Several wooden fishing steamers, for undisclosed interests.

S. A. MOULTON, PRINCE RUPERT, B.C.

BRITISH-AMERICAN SHIPBUILDING & ENG. CO., VANCOUVER, B.C.

JOHN COUGHLAN & SONS, N. VANCOUVER, B.C.
Building four 8,100 ton steamers for Canadian Government. Four 8,800 ton steamers same as "Alaska."

THE FOUNDATION CO., VANCOUVER, B.C.

FRASER VALLEY SHIPBUILDING CO., VANCOUVER, B.C.

RANT, SMITH & CO., VANCOUVER, B.C.

HARRISON & LAMOND, SHIPBUILDERS, LTD., VANCOUVER, B.C.

LYALL SHIPBUILDING COMPANY, N. VANCOUVER, B.C.
Building eight wooden steamers of 1,500 tons capacity for French Government.

W. R. MANCHION, VANCOUVER, B.C.

STANDARD SHIPBUILDING CO., VANCOUVER, B.C.
Three vessels, "Donohue" composite type. 3,500 deadweight. Standard engines, 1,200 I.P.H. Keel laid June 1st. To be launched December and completed January, 1920.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
Number of small vessels being constructed at total value of $300,000.
4,500-ton floating drydock, 352 ft. long.

VANCOUVER SHIPYARD, LTD., VANCOUVER, B.C.

THE WALLACE SHIPYARDS, LIMITED, NORTH VANCOUVER, B.C.
Building four steamers for Dominion Government; two of 4,300 tons deadweight and two of 5,100 tons deadweight.

CHOLBERG SHIPYARD, VICTORIA, B.C.
4 1,500-ton vessels for Norwegian purchasers. Keels laid Oct. 4th, 10th and 25th respectively.

TAYLOR ENGINEERING CO., VANCOUVER, B.C.
"Teco," 300 tons. Motor coasting freighter fitted with Bolinder 200 h.p. Built for William Mason Rooke.

NEW WESTMINSTER CONSTRUCTION & ENGINEERING CO., NEW WESTMINSTER, B.C.

NORTHERN CONSTRUCTION CO., VANCOUVER, B.C.
5 1,500-ton d.w. compound engines, 12 x 24 x 16 stroke, twin screw water tube boilers, 2,000 sq. feet heating surface. Building for French Government.

PRINCE RUPERT SHIPBUILDING AND ENGINEERING CO., PRINCE RUPERT, B.C.
Two 8,100 tons deadweight steamers for Canadian Government.

WESTERN CANADA SHIPYARDS ,LTD., VANCOUVER, B.C.
"War Nootka," Jan. 4, 1918, 3,080 tons (machinery installed at Ogden Point Assembly Sheds).
Six wooden freight steamers, 250 ft. h.p., 259 ft. o. a., 43½ ft. extreme breadth, molded 42½ ft., 25 ft. molded depth., draft 22 ft., 2,800 tons d. w., for undisclosed interests. "War Nootka," launched January 4, 1918. "War Selkirk" launched March 6, 1918.
"War Tatla," "War Casco, "War Chilkat," "War Tanoo," 4 standard vessels now under construction.

CAMERON-GENOA MILLS CO., VANCOUVER, B.C.

THE FOUNDATION COMPANY, VICTORIA, B.C.
Building twenty wooden steamers of 3,000 tons deadweight for French Government.

CLARENCE HOARD, VICTORIA, B.C.
Wooden car barge for C.P.R., Jan., 1918.

VICTORIA SHIPBUILDING CO., VICTORIA, B.C.
Constructing wooden ships for British Govt., 3,500 tons each.

VICTORIA MACHINERY DEPOT, VICTORIA, B.C.
Two 8,100 tons deadweight steamers for Canadian Government.

NEW BRUNSWICK

C. T. WHITE & SON, LTD., ALMA, N.B. (Office at Sussex, N.B., also.)

JAMES X. LENTEIGNE, LOWER CARAQUET, N.B.

INTERNATIONAL SHIPBUILDING CO., NEWCASTLE, N.B.

EUREKA SHIPBUILDING CO., NORTH HEAD, N.B.

PORT COLBORNE BUILDING & REALTY CO., LTD., REXTON, N.B. (Head Office, Welland, Ont.)

GRANT & HORNE, ST. JOHN, N.B.
Two wooden cargo steamers, "War Fundy" (launched Aug., 1918) and "War Moncton," 250 ft. x 42 ft. 5 in. x 25 ft. 5 in., 1,000 h.p., speed 9½ knots, 2,800 tons d.w., for undisclosed interests.

MARINE CONSTRUCTION CO., CANADA, LTD., ST. JOHN, N.B.

ST. JOHN SHIPBUILDING CO., ST. JOHN, N.B. (Plant at Courtenay Bay.)

ST. MARTIN'S SHIPBUILDING CO., ST. MARTIN'S, N.B.

PETER & A. A. McINTYRE, ST. JOHN, N.B.
One 900-ton schooner under construction.

NEWFOUNDLAND

ANGLO-NEWFOUNDLAND DEVELOPMENT CO., BOTWOOD, NFLD.
Two three-mast aux. schrs., wood, 450 tons, 150 H.P. for the builders' account.

NEWFOUNDLAND SHIPBUILDING CO., HARBOR GRACE, NFLD.
To build ships of 1,200 tons d.w. Steel ships later.

M. E. MARTIN, MORRIS ARM, NR. ST. JOHN'S, NFLD.

UNION SHIPBUILDING CO., ST. JOHN, NFLD.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL, N.S.

NOVA SCOTIA

B. L. TUCKER, BASS RIVER, N.S.

JAS. S. CREELMAN, BASS RIVER, N.S.

HANKINSON SHIPBUILDING CO., BELLIVEAU'S COVE, N.S.
One schooner, 360 tons, wood.

ELI PUBLICOVER, BLANDFORD, N.S.

BRIDGEWATER SHIPPING Co., BRIDGEWATER, N.S.

W. A. NAUGLER, BRIDGEWATER, N.S.

H. MAC ALONEY, CANNING, N.S.

S. M. FIELDS, CAPE D'OR, N.S.
One three-masted schooner, 350 tons.
Keel laid for another three-master.

CHESTER BASIN SHIPBUILDERS, LTD., CHESTER BASIN, N.S.
Two schooners, 100 tons, wood. Launched Aug., 1917, Dec., 1917
One four-masted schooner, 60 tons. Launched Sept., 1918.
One two-masted schooner, 100 tons. Launched June, 1918.

MORTIMER PARSONS, CHEVERIE, N.S.
One wooden three-masted schooner, 170 ft. x 38 ft. x 14 ft., 575 gr. tons, 900 tons cap., for builder's account. Launched Sept., 1918.
Two wooden three-masted schooners for builder's account.
One tern schooner, "Donald Parsons," 140 ft. keel x 34 ft. 4 in. x 12 ft. 4 in., 500 gross tons, 825 tons d.w. for Mortimer Parsons. Launched May 11, 1918.
Another vessel, same size. Launched Nov., 1918, for builder's account.

BAY SHORE SHIPYARD, CHURCH POINT, N.S.
Building two wooden vessels for R. C. Elkin, Ltd., St. John, N.B.

MOISE BELLIVEAU, CHURCH POINT, N.S.
One schooner, 450 tons, wood.

FIDELE BOUDREAU, CHURCH POINT, N.S.
One schooner, 350 tons, wood.

J. E. GASKILL, CHURCH POINT, N.S.
Other yards at Grosses Coques, Little Brook, Meteghan and Port Wade, N.S.
Five wooden schooners from 344 to 387 reg. tons. All sister ships.

COMEAU SHIPBUILDING CO., COMEAUVILLE, N.S.
One three-masted wooden schooner, for builder's account, 450 tons.

J. W. COMEAU, COMEAUVILLE, N.S.
One schooner, 329 tons, Jan., 1918.

J. N. RAFUSE & SONS, CONQUERALL BANKS, DIGBY CO., N.S. (Other plants at Salmon River and Shelburne, N.S.)

E. F. WILLIAMS, DARMOUTH, N.S.

ROBAR BROTHERS, DAYSPRING, N.S.
Schooner for Capt. Ivan Creaser, Dayspring.

MAURICE E. LEARY, DAYSPRING, N.S.
One wooden schooner, 225 tons, 135 ft. o. a. Launched Aug., 1918, for La Have Outfitting Co., La Have, N.S.

J. NEWTON PUGSLEY & CHAS. ROBERTSON, DILIGENT RIVER, N.S.
One schooner, three-masted, 475 tons.

McLEAN & McKAY, ECONOMY, N.S.

S. J. SOLEY, ROX RIVER, N.S.
One schooner, three-masted, 121 ft. keel, 300 tons. Built of native wood. Launched Sept., 1918. For builder's account. For sale.

ALLAN & FRASER, FRASERVILLE, N.S.
One schooner, 350 tons, wood.

BERNARD W. MELANSON, GILBERT'S COVE, N.S.
One three-masted schooner, wood, 250 tons net. Completed November, 1918, for builder's account.

AMOS BLINN, GROSSES COQUES, N.S.
One schooner, 375 tons. Jan., 1918.
One schooner, 350 tons, wood.

BINN BROS., GROSSES COQUES, N.S.

F. K. WARREN & CO., GROSSES COQUES, N.S. (Offices in Union Bank Chambers, Halifax, N.S., also.)
350-ton tern schooner, under construction Jan., 1918.

HALIFAX SHIPBUILDING COMPANY, HALIFAX, N.S.
Building four steamers for Canadian Government. Two of 8,100 tons and two of 10,000 tons. One keel laid January. Also operating dry dock and repair works.

J. WILLARD SMITH, HILLSBURN, N.S. (Head Office, St. John, N.B.)
One tern schooner, wood, 140 ft. keel, 35 ft. beam, 450 tons net reg. tons.

J. W. RAYMOND, LITTLE BROOK, N.S.
Building 500-ton wooden schooners for local owners.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S.
One 800-ton vessel for undisclosed interests. Launch about Dec. 24.

CONRAD & REINHARDT, LUNENBURG, N.S.
"Excellent," 600-ton, launch in January next. Also 175-ton schooner.

J. WILLARD SMITH, HILLSBURN, N.S.
Wooden three-masted schooner. Launch in April, 1919.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.
750-ton auxiliary schooner. Completed in January, 1919.

OSMOND O'BRIEN & CO., NOEL, N.S.
"J. Miller," 700 tons. Keel laid April 18. Launched Nov. 20. Completed Nov. 27.

BERNARD & MELANSON, GILBERT'S COVE, N.S.
550-ton vessel for owner's account. Completed Nov. 25.

ANNAPOLIS SHIPPING CO., ANNAPOLIS ROYAL
"Mapleland," 1000-ton schooner, fitted with twin Fairbanks-Morse oil engines, 200 horsepower. Complete about Dec. 10. For builder's account.

L. S. CANNING, WARD'S BROOK, N.S.
"W. C. Smith," 700 tons. Completed Dec. 18.

McLEAN & McKAY, ECONOMY, N.S.
"Truro Queen," 750 tons, 15 h.p. engine for hoisting sails and anchor. Completed.

HENRY COVEY, INDIAN HARBOR, N.S.

CHARLES GRIFFIN, ISAACS HARBOR, N.S.
One schooner, 40 tons, wood.

LEWIS SHIPBUILDING CO., LEWISTON, N.S.
One schooner, 670 tons. Jan., 1918.

INNOCENT COMEAU, LITTLE BROOK, N.S.
One three-masted schoner, 140 ft. x 35 ft. 6 in. x 17 ft. 6 in., 650 gr. tons, for the Weymouth Shipping Co., Weymouth, N.S., Can. Delivered Jan. 18, 1918.

J. W. RAYMOND, LITTLE BROOK, N.S.
One wooden schooner, No. 4, 140 ft. x 36 ft. x 17 ft., 575 gr. tons, for Jones Bros., Weymouth, Digby Co., N.S.

H. A. FRANK, LIVERPOOL, N.S.
Two wooden schooners, 500 tons, for builder's account.

McKEAN SHIPBUILDING CO., LIVERPOOL, N.S.

W. F. McKEAN & CO., LIVERPOOL, N.S.
One schooner 400 tons, Jan., 1918.

D. C. MULHALL, LIVERPOOL, N.S.
Two wooden schooners, one 300 gross tons, other 400 gross tons, for undisclosed interests.

ROBIN, JONES & WHITMAN, LIVERPOOL, N.S.
One schooner, 340 tons, wood.

SOUTHERN SALVAGE CO., LIVERPOOL, N.S.

CONRAD & REINHARDT, LUNENBURG, N.S.

LUNENBURG MARINE RAILWAY, LUNENBURG, N.S.

FRED A. ROBAR, LUNENBURG, N.S.

J. B. YOUNG, LUNENBURG, N.S.

ERNST SHIPBUILDING CO., MAHONE BAY, N.S.

J. ERNEST & SON, MAHONE BAY, N.S.
One schooner, 520 tons. Jan., 1918.

O. A. HAM, MAHONE BAY, N.S.
One schooner, "Dozle," 128 tons. Launching May 30. One motor boat about 20 tons.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S. (Leased to Montague Mahaffy, Toronto.)
One three-masted schooner, 325 tons gr. reg., 500 tons cap., West Indies freight type. Launched July.
Keel laid for another three-masted schooner with cargo capacity of 425 tons.

JOHN McLEAN & SONS, MAHONE BAY, N.S.
One schooner, 95 tons, wood.

J. A. BALSOM CO., LTD., MARGARETSVILLE, N.S.
One schooner, 409 tons. Jan., 1918.

CLARE SHIPBUILDING CO., METEGHAN RIVER, N.S.
One wooden schooner for builder's account. 400 tons.

A. H. COMEAU & CO., METEGHAN, N.S.
One schooner, 400 tons, wood.

AGAPIT COMEAU, METEGHAN, N.S.

JOHN F. DEVEAU, METEGHAN, N.S.
A 300-ton schooner was launched recently for Ritcey & Co., Lunenburg, N.S., and named Charles A. Ritcey.
1 schooner, 425 tons. Jan., 1918.
1 schooner, 400 tons, wood.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
One wooden sailing schooner, 800 tons d.w. Keel laid April 15th, 1918, to be launched December 17th and completed December 31st. Built for sale.

J. E. GASKILL, CHURCH POINT, N.S.
One wooden schooner, 750 tons d.w. Keel laid March, 1918, to be launched December 15th. Built for J. E. Corkill.

THERIAULT SHIPBUILDING CO.
One wooden vessel, 500 tons d.w. Keel laid September 18th, to be launched in May, 1919. Built for owners account.

SIDNEY ST. C. JONES, WEYMOUTH, N.S.
One tern schooner, "Westway," 450 tons d.w. Keel laid April 18, to be launcheed December 30, 1918, and completed in January, 1919. Built for sale. 130 feet by 28 feet 8 inches beam by 10 feet 6 inches deep.

THE HANKINSON SHIPPING CO., BELLEVEAU'S COVE, N.S.
One vessel, 750 tons d.w. "Charles Doucet," fitted for auxiliary engine. Keel laid April 1, to be launched December 17. One vessel 750 tons d.w. Keel laid Aug., 1918, to be launched April, 1919, and completed. Built for owners account.

FAUQUIER & PORTER, HANTSPORT, N.S.
One vessel 1,800 tons d.w. to be fiitted with two 100 h.p. crude oil engines (Canadian Fairbanks-Morse). Launched December, 1918, and completed January, 1919. Built for sale. Propose to lay keels for two 500-ton, 3-mast schooners as soon as this schooner is launched.

N.S. SHIPBUILDING & TRANSPORTATION CO., LIVERPOOL, N.S.
"Protea," 400 tons d.w., three-masted schooner with provision for Morse semi-Diesel engines. Keel laid Nov. 18. To be completed May account and sold to Pearson & Walker, Cape Town, S.A.
"Gordon T. Tibbs," 400 tons d.w., three-masted schooner. Keel laid Aug. 30. To be launched Dec. 15 and completed Jan. 19. Built for buildeer's account and sold to G. Tibbs & Sons, St. John's, Nfld.
One beam trawler, 900 tons d.w., 400 i.h.p., with two 200 Fairbanks-Morse semi-Diesel engines. Keel laid Nov. 19. To be completed May next. Built for Rafuse Grey et al Le Havre. Repairing schooner Karmoe for N.Y. owners.

H. ELDERKIN & CO., PORT GREVILLE, N.S.
Two vessels, 825 and 500 tons respectively. Keel laid April and August. To be launched December and January. Built for builder's account.

J. E. GASKILL, METEGHAN, N.S.

THOMAS GERMAN, METEGHAN, N.S.
One schooner, 350 tons, wood.

R. H. HOWES CONSTRUCTION CO., METEGHAN, N.S. (Leased James Cosman's shipyards.)
Building several wooden schooners for own account.

DR. F. H. MACDONALD, METEGHAN, N.S.

METEGHAN RAILWAY & SHIPBUILDING CO., METEGHAN, N.S.
One wooden three-masted schooner, 182 ft. x 35 ft., 450 gr. tons.
One schooner, 470 tons, wood.

CHAS. McNEIL, NEW GLASGOW, N.S.
One wooden 3-masted schooner, 103 ft. x 30 ft. x 10 ft. 9 in., 200 tons, for builder's account. Launched July, 1918.
One wooden 3-masted schooner, 142 ft. x 25 ft. 4 in. x 13 ft., 500 gr. tons, for builder's account. Launched Oct., 1918.

THE NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.
Building two 2,800 ton steamers for Dominion Government.

O'BRIEN BROS., NOEL, N.S.
One schooner, 325 tons, wood.

W. R. HUNTLEY & SON, PARRSBORO, N.S.
One wooden schooner, 175 ft. x 39 ft. x 17 ft., 900 gross tons, for

C. T. WHITE & SON, SUSSEX, N.S.

WAGSTAFF & HATFIELD, PARRSBORO, N.S.
One schooner, 400 tons. Jan., 1918.

S. SALTER, PARRSBORO, N.S.

DOWLING & STODDART, PORT CLYDE, N.S.

SWIME BROS., PORT CLYDE, N.S.
Several small motor trawlers, for builder's account.

G. M. COCHRANE, PORT GREVILLE, N.S.

ELLIOTT GRAHAM, PORT GREVILLE, N.S.
One schooner, 360 tons. Jan., 1918.

SMITH CANNING CO., PORT GREVILLE, N.S.
One schooner, 350 tons, wood.

WAGSTAFF & HATFIELD, PORT GREVILLE, N.S.
One schooner, 400 tons, wood.

WILLIAM CROWELL, PORT LATOUR, N.S.

J. W. RAYMOND, PORT MAITLAND, N.S.
One schooner, 375 tons. Jan., 1918.

PORT WADE SHIPBUILDING CO., PORT WADE, N.S. (Head Office, Digby.)
One 350-ton schooner, wood.

JOHN BROWN, PUBLIC LANDING, N.S.
One tow barge, 50 tons, wood.

THE CUMBERLAND SHIPBUILDING CO., PUGWASH, N.S.
Establishing plant for the construction of wooden ships.

MACKENZIE SHIPPING CO., RIVER JOHN, N.S.
One four-masted schooner, 600 tons, wood. About half built. Fitted for aux. engines.

CHARLES McLELLAN, RIVER JOHN, N.S.
One schooner, 100 tons, wood.

W. J. FOLEY, SALMON RIVER, N.S.
Building for J. N. Rafuse & Sons one wooden, 300 tons, under construction. Cap. of plant, 1,000 tons yearly.

J. N. RAFUSE & SONS, SALMON RIVER, N.S. (Other plants at Shelburne and Conquerall Banks.)
Launched recently a three-masted schooner named "Industrial," at W. J. Foley's ship yard at Salmon River, N.S., of the following dimensions: length, 113 ft, breadth, 30 ft., depth, 11½ ft., 325 tons.

ACADIAN SHIPPING CO., SAULNIERVILLE, N.S.
One schooner, 00 tons, wood.

SAULNIERVILLE SHIPBUILDING CO., LTD., SAULNIERVILLE, N.S.

J. LEWIS & SONS, SHEET HARBOR, N.S.
One schooner, wood, four-masted, 725 gr. tons. To be completed Sept.. 1918. For private account.

GEO. A. COX, SHELBURNE, N.S.
One schooner, 200 tons, wood.
One schooner, 322 tons, wood.

JOSEPH McGILL SHIPBUILDING & TRANSPORTATION CO., SHELBURNE, N.S.
"Sparkling Glance," 246 tons register, for Harvey & Co., St. John's, Nfld.
One schooner, 160 tons, wood.

W. C. McKAY & SON, SHELBURNE, N.S.
One wooden schooner, 130 ft. o. a. x 26½ ft. x 11 ft. depth of hold, 140 tons register. Launched Dec. I, 1917.
One three-masted schooner, for Messrs. Hallet, of Newfoundland.
One schooner, 620 tons, wood.

BIGELOW BROS., CANNING, N.S.
Building 400-ton tern schooner, to be launched in May, 1919.

CONRAD & REINHARDT.
"Con-Rein," 600-ton schooner for own account. To be completed May, 1919.

O. A. HAM, MAHONE BAY, N.S.
Wooden steamer, 500 tons, triple engines. Built for M. A. Young & Co., Sydney. To be completed about July 15th.

McLEAN CONSTRUCTION CO., MAHONE BAY, N.S.
200-ton schooner. Keel laid April 28th. For sale.

SIDNEY ST. C. JONES, ESQ., PLYMPTON AND WEYMOUTH, N.S.
Not building at present.

NOVA SCOTIA STEEL & COAL CO., NEW GLASGOW, N.S.

W. J. FOLEY, SALMON RIVER, N.S.
Building 650-ton schooner for J. A. Rafuse & Sons, about Sept. 15.

SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.
"Helen Mathers," 775 tons d. w. Built for A. Moulton & Sons, Halifax, N.S. Now building topsail schooner 550 tons d. w. for French interests with auxiliary oil engines.

T. K. BENTLEY, WEST ADVOCATE, N.S.
Building 1,000-ton sailing schooner, 3 masts, auxiliary engine for hoisting, to be completed in September.

J. N. RAFUSE & SONS, SHELBURNE, N.S. (Other plants at Salmon River and Conquerall Banks.)

THE SHELBURNE SHIPBUILDERS, LTD., SHELBURNE, N.S.
One tern schooner, "Misty Star," 145 ft. x 31 ft. x 11 ft. 6 in., 600 tons d.w., 330 tons gross, for Harvey & Co., St. John's, Newfoundland. Launching Mar. 15, 1918.
One tern schooner, 154 ft. x 32 ft. x 12 ft. 4 in., 400 gr. tons, 700 tons d.w. cap. Launching June, 1918. Not sold yet.
Two schooners, one 349 tons, other 400 tons.

EASTERN SHIPBUILDING CO., SHIP HARBOR, N.S.
One wooden schooner, 600 tons d.w., for J. N. Rafuse & Sons., Halifax, N.S., Can.
One wooden schooner, 300 tons.

STEPHEN MORASH & CO., SHIP HARBOR, N.S.
One wooden schooner, 150 ft. x 37 ft. x 13 ft., four masts, for Canadian interests. Keel laid Feb. 5, 1917.

JAMES E. PETTIS, SPENCER'S ISLAND, N.S.
One schooner, 425 tons, wood, three-masted.

CAPE BRETON SHIPBUILDING CO., SYDNEY, N.S.

THE TUSKET SHIPBUILDING CO., TUSKET, N.S.

AMOS H. STEVENS, TANCOOK, N.S.

ALVIN STEVENS, TANCOOK, N.S.

STANLEY MASON, TANCOOK, N.S.

ALBERT PARSONS, WALTON, N.S.
One schooner, 400 tons. Jan., 1918.

H. T. LeBLANC, WEDGEPORT, N.S.
One steam trawler, 165 ft., 600 tons, for J. N. Rafuse & Sons.

L. S. CANNING, WARDS BROOK, N.S.
One tern schooner, 350 tons, for W. C. Smith & Co., Lunenburg, N.S

WEDGEPORT NAVIGATION & TRANSPORTATION CO., WEDGE PORT, N.S.

T. K. BENTLEY, WEST ADVOCATE, N.S.
One 200-ton steamer.
One 4-masted schooner, wood, 511 tons. To be launched September or October. For owner's account.

J. W. KIRKPATRICK, WEST ADVOCATE, N.S.
One 350-ton schooner, wood.

BOEHNER BROS., WEST LA HAVE, N.S.
Two large fishing schooners, 150 tons each.
One beam trawler, 300 tons, crude oil engines. For local interests.

BEAZLEY BROS., WEYMOUTH, N.S. (Head Office Roy Bldg., Halifax.)
One schooner, 394 tons, three masts.

E. R. GAUDET, WEYMOUTH, N.S.
One 350-ton schooner, three-masted.

E. P. RICE, WEYMOUTH, N.S.
One three-masted schooner, 350 tons.

RICE, WARREN & CO., WEYMOUTH, N.S.
One three-masted schooner, 334 tons.

FALMOUTH SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.
One wooden schooner, 350 gr. tons, 700 tons cap., for undisclosed interests.

NOEL SHIPBUILDING & TRANSPORTATION CO., WINDSOR, N.S.
One wooden schooner, three masts, 138 ft. x 35 ft. x 13 ft., 450 net reg. tons. Oil auxiliary engines. Launching August, 1918, for builder's account.

C. A. NICKERSON, WOODS HARBOR, N.S.

MILTON SHIPBUILDING CO., YARMOUTH, N.S.
Taken over and enlarging old plant of James Jenkins.
350-ton schooner building.

W. O. SWEENY, YARMOUTH, N.S.
100-ton fishing schooner.

YARMOUTH SHIPBUILDING CO., YARMOUTH, N.S.
One 450-ton wooden schooner, 128 ft. keel. To be completed Oct., 1918.

ONTARIO

CANADIAN ALLIS-CHALMERS LTD., BRIDGEBURG.
Four 3,500-ton steamers for I.M.B.; one launched, one ready to launch.

COLLINGWOOD SHIPBUILDING COMPANY, COLLINGWOOD, ONT.
"Canadian Recruit," launched May. Two steel steamers on berths.
"Canadian Warrior" completed. Three steel steamers on berths.

R. MORRILL, COLLINGWOOD, ONT.
"Windsor," Aug. 10, steam tug, 105 ft., for Ontario Gravel & Freighting Co.

CANADIAN CAR & FOUNDRY CO., FORT WILLIAM.
No present contracts.

DOMINION SHIPBUILDING COMPANY, TORONTO, ONT.
Building six canal sized steamers for own account. Three launched, remainder to be launched May, June, July. All to be completed this season.

GREAT LAKES DREDGING CO., FORT WILLIAM.
No present contracts.

THUNDER BAY CONTRACTING CO., FORT WILLIAM, ONT.
One wooden freight steamer, 261 ft. long, for undisclosed interests.

NATIONAL SHIPBUILDING COMPANY, GODERICH.
Building marine engines and boilers.

COLLINGWOOD SHIPBUILDING COMPANY, KINGSTON, ONT.
Building 3,500 ton steamer for Canadian Government.

DAVIS DRY DOCK CO., KINGSTON, ONT.
Building steel lifeboats.

GEORGIAN BAY SHIPBUILDING & WRECKING CO., MIDLAND.
Repairing several wooden tugs.

MIDLAND SHIPBUILDING COMPANY, MIDLAND.
"War Magic," second steamer for I. M. B., launched in May.
Two steel steamers for Imperial Munitions Board.

MIDLAND DRY DOCK CO., MIDLAND, ONT.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONT.
Building six ships for the Canadian Government and six trawlers.

MUIR BROS.' DRYDOCK, PORT DALHOUSIE.
Repairing the wooden freight steamer "Windsor."

J. W. GEROW, ROSSPORT, ONT.

REID WRECKING CO., SARNIA, ONT.

DOMINION SHIPBUILDING CO., TORONTO, ONT.
Building six steel steamers, 3,500 tons, for undisclosed interests.

POLSON IRON WORKS, TORONTO, ONT.
"War Timiskaming" launching in February. Three steel steamers on stocks. "War Hamilton" completed and ready for sea.

PRINCE RUPERT DRY DOCK AND ENGINEERING COMPANY, PRINCE RUPERT, B.C.
Building two steamers for Canadian Government, 8,100 tons each.

PORT ARTHUR SHIPBUILDING CO., PORT ARTHUR, ONTARIO
"Canadian Trader," launched May 5th. "Canadian Sailor," launched. Both vessels to be completed in June.

TORONTO SHIPBUILDING CO., LTD., TORONTO, ONT. (Toronto Dry Dock Co., Ltd., under same management.)

BRITISH AMERICAN SHIPBUILDING CO., WELLAND.
"War Weasel" delivered; "War Badger" completed; 2 steamers for Canadian Government, 4,300 tons each.

PRINCE EDWARD ISLAND

THE CARDIGAN SHIPBUILDING PLANT, CARDIGAN, P.E.I.
Building tern schooner, 160 tons, to be launched in October.

QUEBEC

R. N. LE BLANC, BONAVENTURE, QUE.

J. Z. DEGAGNE, EBOULEMENTS, QUE.

THE DAVEY SHIPBUILDING COMPANY, LAUZON, QUEBEC
Building fifteen wooden vessels of 1,500 tons for French Government. Two 5,100 ton steamers for Canadian Government. One keel laid. Operating Champlain Dry Dock. Building extensive new machine shops. Building six trawlers for Department of Naval Service.

ATLAS CEMENT CONSTRUCTION CO., LTD., MONTREAL, QUE.

CANADIAN VICKERS, LIMITED
Building five 8,100 ton steamers for Canadian Government. One 4,450 ton steamer for Canadian Government. One 8,300 ton steamer for French Government.

FRASER BRACE & CO., MONTREAL.
Eight wooden steamers for French Government, 1,500 tons each.
Four 5,100-ton steamers for Canadian Government.

H. H. SHEPHERD, SOREL, QUE.
Building four 1,200-ton wooden scows. No propelling power.
Rebuilding seven drifters. Particulars withheld owing to govt. restrictions.

HALL ENGINEERING CO., MONTREAL, QUE.

MONTREAL DRY DOCK & SHIP REPAIRING CO., MONTREAL, QUE.
Operate dock 428 ft. long 30 ft. deep.

MONTREAL SHIPBUILDERS LTD., 37 Belmont St., MONTREAL, QUE. (Associated with Atlas Construction Co.

THE QUEBEC SHIPBUILDING AND REPAIR CO., Board of Trade Bldg., MONTREAL, QUE.
2 vessels for undisclosed interests 3,000 tons each.

QUINLAN & ROBERTSON, MONTREAL, QUE. (Yards at Quebec.)
Four wooden steamers, for undisclosed interests.

LOUIS GAUNDRY, 12 St. Peter St., QUEBEC, QUE.

QUEBEC SHIPBUILDING & REPAIR CO., ST. LAURENT, QUE.
2 schrs. 1,400 tons and 1,200 tons.
One wooden four-masted auxl. schooner "Martin Connolly," 223 ft. x 42 ft. x 20 ft., 2,100 tons d. w., for undisclosed interests. Launched Oct. 28, 1917.

QUINLAN & ROBERTSON, QUEBEC, QUE.
Four wooden steamers, totalling 6,400 tons, for undisclosed interests.

CANADIAN GOVERNMENT SHIPYARDS, SOREL, QUE.
One steel vessel for undisclosed interests.

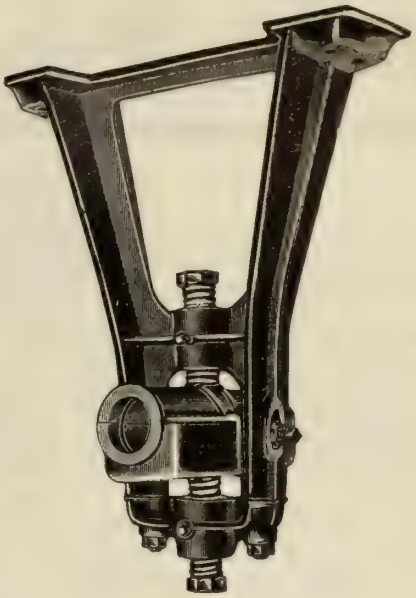
SINCENNES-McNAUGHTON LINES. SOREL, QUE.
One tug 410 tons, wood.

CAN. GOVERNMENT SHIPYARD, SOREL, QUE.
One steel vessel for undisclosed interests.
Building steam trawlers and wooden drifters for undisclosed interests.

TIDEWATER SHIPBUILDERS, LTD., THREE RIVERS, QUE.
Building four 1,500-ton steamers for Canadian Government. Two to be launched this season.

LECLAIRE SHIPBUILDING CO., SOREL, QUE.
Building drydock of 7,000 tons capacity.
Six steel trawlers 125 feet long with single screw triple expansion engines, 500 i.h.p. Two of these launched in November. One more to be launched before ice comes in. Six wooden auxiliary schooners fitted with twin screw "Skandia" engines of 120 h.p. each. These will be all in frame at the end of November and four ready for launching as soon as ice is clear next spring.

NATIONAL SHIPBUILDING CORPORATION, THREE RIVERS, QUE.
"War Mingan" and "War Radnor," launched Oct. 15 and No. 2. Built for the Imperial Munitions Board and will be operated by Anning Bros., Cardiff, Wales. Now building 10 self-propelling barges for France.



Fairbanks-Morse Transmission

Fairbanks-Morse transmission has long been recognized through its high Standard of quality, its permanence and economy.

We are prepared to help you solve many of your transmission problems by means of Fairbanks-Morse transmission and the benefit of the experience of our transmission experts.

Fairbanks-Morse transmission equipment includes shafting, hangers, pulleys, belt, couplings, friction clutches, shifters, dynamos and engines.

The largest stock in Canada guarantees you the best selection.



The Canadian Fairbanks-Morse Co., Limited

"Canada's Departmental House for Mechanical Goods"

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria

MARINE NEWS FROM EVERY SOURCE

Mr. Lovell G. Mickles is retiring from the position of the Montreal Coal & Dock Co.

L. W. Simms, St. John, has been appointed one of the vice-presidents of the Maritime Provinces branch of the Canadian Manufacturers' Association. Hon. W. F. Roberts has been elected a vice-president of the Canadian Public Health Association.

Vancouver.—The Tyndareus of the Blue Funnel Line is about to leave for Seattle, where she will load fifteen large size Baldwin locomotives and other railway material for Vladivostok. The Tyndareus is a 14,500 ton deadweight vessel.

Gananoque.—The two submarine chasers built at the Clayton Ship and Boat Building Co., known as Nos. 411 and 412, left for Chicago under their own power. They have been ready to sail for some time, but have been delayed waiting for compasses and other equipment.

Brockville.—The Soulanges Canal was the scene of a collision between the steamers Joyland and Robt. S. Rhodes, of the Hall Line. Both vessels were damaged and will have to be docked to ascertain the extent, and make repairs. The Joyland continued her voyage to Montreal and the Robert E. Rhodes went to Ogdensburg.

Victoria.—The Nippon Yuson Kaisha steamer "Kature Maru" sailed from here for the Orient with a Red Cross party and an aviation party bound for Siberia. The Red Cross party consisted of doctors and nurses for the hospitals along the route of the Siberian railway. The aviation party consisted of twelve French airmen also for Siberia.

Brockville.—The steamer Compton, which went ashore on a shoal near Butternut Bay last Fall has been refloated. She was abandoned to the underwriters after going ashore, but later was purchased from the underwriters by her owners. The salvage operations were performed by Captain Hinckley, of Oswego, in about three weeks' time. The Compton was taken to Ogdensburg, where she will be hauled out at the shipyard and repaired.

Victoria.—The yards of the Foundation Co. were the scene of another launching, when the steamship "Canada" was successfully launched in the presence of a large and distinguished company. Capt. Andre Millot and A. O. P. Francis, the French consul, were among the guests. Capt. Millot is the French High Commissioner, and has been on the coast some time looking after the various French interests. The "Canada" was the seventh of the wooden steamers to be launched on the present contract for twenty.

Amherst.—The schooner William McL. Borden, named after one of the boys of Pugwash, who gave his life in France, was launched recently from the yard of the Cumberland Shipbuilding Co., Pugwash. The vessel has been sold to a firm in St. John's, Newfoundland.

St. John's, Nfld.—The steamer Neptune, with 300 fishermen on board, was reported to have broken her propeller shaft in the heavy ice off Belle Isle. The steamer Diana was sent to her assistance as soon as word was received, and will endeavor to tow her to port, or, failing that, will take off her crew.

Victoria.—The contract for the lighthouse and lighthouse buildings for the Aga light on Barret Island has been let to Mr. Stockley, a Prince Rupert contractor. The new light will be a similar one to that at Ogden Point Breakwater, and will be electrically operated from a plant on a nearby point on shore.

Company Gets Cash.—In connection with the suit taken by the Canada Car Co. against the American Car Co over munition contracts, a decision has been given in the American courts awarding the Canada Car and Foundry Co. the sum of $780,000. Both the U. S. and Canadian Governments have made final settlements with the company on outstanding munition accounts.

Cleveland.—The beginning of the annual ore movement is in sight. The grain that has been carried over the winter in steamer holds has now been cleaned out, and all these vessels are available for the movement of iron ore. Recent charters of space are of sufficient volume to move 100,000 tons, but at present there is not much business for outside vessels. Most of the business done by outside vessels is due to the Steel Corporation sending ore forward at a pretty good rate.

Ottawa.—The amount of $350,000 was included in the estimates for work on the Welland Canal. This is part of a total expenditure of $16,000,000 that will be devoted to the work of widening and deepening the Welland Canal. There was some opposition from the Hon. Rodolphe Lemieux based on the financial situation, but this was soon overcome and the item passed.

Lloyd Harris is Optimistic.—The head of the Canadian Trade Commission has returned to Canada full of hope for the future trade of the Dominion. He says that Canada compares favorably in costs of production with Great Britain or any European country. Great opportunities for trade exist in the near East and the arrangement of a credit of $100,000,000 for Roumania would result in a permanent development of export trade.

The Government of British Columbia have granted a sum of $2,000 to help cut the cost of conducting a demonstration of smelting iron ore by the electrical process. Mr. Fraser, of the Vancouver Magnetite Iron and Steel Smelting Company, and Mr. Fleet, an electrical engineer, were the gentlemen composing the delegation which interviewed the Government on the subject. The claim of Mr. Fleet is that in the furnace invented by him, a ton of pig iron can be produced at the cost of $13.55 a ton, and, eventually, to $11 a ton.

Lachine.—Returns from the Lachine Canal show that the traffic is resuming a normal activity, though not yet up to the pre-war quantities in every particular. The tonnage passed through shows a marked increase over the corresponding month last year, and the number of trips were 961 against 938 in the corresponding period last year. Cargo carried shows an increase of 24,116 tons, and grain an increase of nearly 3,000,000 bushels. Against this is a pronounced falling off in the amount of coal passing through, the decrease in soft coal being 1,300 tons, and in anthracite a decrease of 4,469 tons.

PERSONALS

Mr. William C. Wilson, of the William C. Wilson Co., is leaving for England the first week in July. Mr. Wilson's visit is in the nature of a business trip, and he intends to try and place a line of auxiliary marine machinery manufactured in Canada with British shipbuilders and shipowners. In the present congested state of the British engineering industries, Mr. Wilson sees a favorable opportunity to exploit Canadian-made goods. The lines include steering gears, winches, windlasses, accommodation ladders, etc., and all have the seal of approval of Lloyd's surveyors.

THE "EMCO" VALVE

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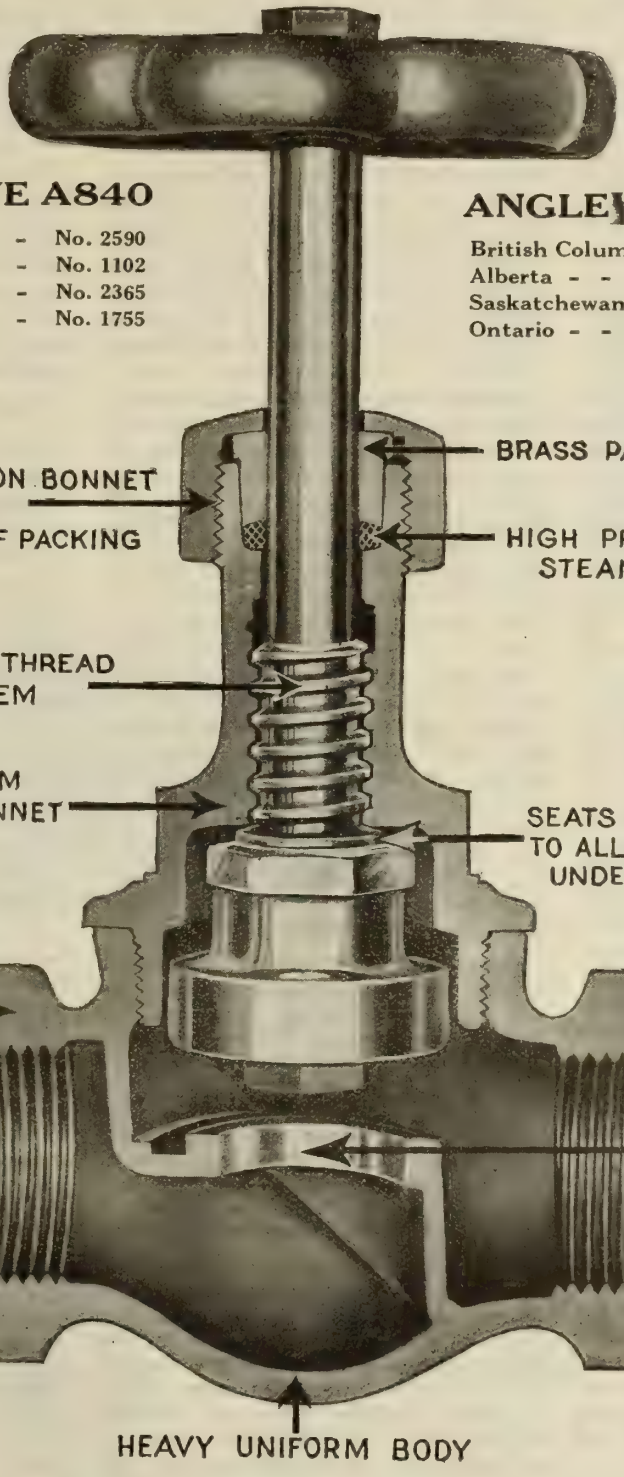
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MERCHANT SAILORS RECEIVE A TRIBUTE

Have Played Big Part in War, Says First Sea Lord

The Earl of Wemyss, First Sea Lord of the Admiralty, speaking at the Mansion House on the occasion of the meeting of the British and Foreign Sailors' Society, said that at present there are 200,000 merchant sailors and 80,000 fishermen serving under the white ensign of the Navy, who were assimilated into the fighting fleet, and, notwithstanding the depletions and tremendous difficulties which the Merchant Marine had suffered, it continued its business as undauntedly as the Navy, whose morale was better than ever, despite submarinism.

The Donald Shipping Company, Ltd., capital stock of $30,000 in 300 shares of $100 each, has been formed to carry on a general shipping and merchandising business. Head office in Montreal.

Victoria.—The "Western Knight," an 8,800-ton steamship, built by the Ames Shipbuilding Company, has had to discontinue her voyage to Japan and return to Seattle on account of springing a leak. No details are known, but it is probable that a plate has sprung. The leak must be a bad one to make it necessary to discontinue the voyage.

Portland Me.—The building of schooners in this district is still a live industry, and the price of hulls is still rising. The expected drop following the war has not yet materialized, and in spite of the numbers launched, there is a demand for more. New vessels receive charters as soon as they are ready for sea.

San Francisco.—The Pacific American Steamship Association was formed here recently, combining all the American shipping interests on the Pacific coast with the exception of the lumber carriers. Captain Robert Dollar was elected president, and A. F. Haines of Seattle, vice-president.

Ottawa.—The pulp and paper manufacturers have approached the Dominion Government with a view to having two of the new Government freighters turned over to them. The idea is to establish a bi-monthly service, the vessels obtaining their cargo at the various pulp and paper mills on the St. Lawrence.

Ottawa.—The Minister of Marine at a meeting with the Canadian Marine and Labor Federation, told them that the Government could not pay war prices for future ships. He expected to bring his further shipbuilding programme before the House very shortly. He thought the prices should be from $15 to $20 per ton less than war rates.

Port Arthur.—The C.P.R. steamer Assiniboia took off the crew of the lake steamer Schlesinger, which was in a sinking condition 35 miles off Passage Island, and sank soon after the crew had been transferred. She was owned by the Massey Steamship Company of Superior, Wis., and was a 3,500-ton boat. She had a cargo of 2,000 tons of coal, and her sinking was the result of a leak.

St. Catharines.—The Burma, a wooden barge, struck the pier on the west side of Port Dalhousie harbor entrance and sank shortly after. The pier was damaged where the barge struck it. Navigation will not be interfered with.

Toronto.—The "Concretia," the first concrete ship to be seen in Toronto, was a visitor here recently. She was built at Montreal last year, and completed at Prescott. She is 120 feet long by 11 feet 3 inches deep, and can make about eight knots an hour.

Kingston. — The Collingwood Shipbuilding Company has made an agreement with its employees giving them an eight-hour day and an increase in wages. For mechanics the minimum wage is 75 cents an hour, helpers to 47½ cents an hour, painters are to receive not less than 45 cents an hour, while the pay for all other workmen will be raised proportionately.

London, Eng.—An effort to arrange a direct steamship service from Montreal to Scandinavian ports is being made by some Montreal manufacturers, and the question is to be taken up with Sir Robert Borden on his return to Ottawa. H. A. Vineberg, a Montreal man who has just returned from Norway and Sweden, says there are good opportunities for trade between Canada and those countries.

Welland.—The yard of the British American Shipbuilding Company at Welland has been closed down till further notice. The company offered the striking employees a 44-hour week and a 10 per cent. increase, which was refused. The company then notified the men that they would be compelled to close down the works, as they could not meet the demands of the men and still build ships profitably.

Vancouver.—Suit has been brought against three shipbuilding firms, the Northern Construction Company, the Pacific Construction Company of Coquitlam, and the New Westminster Construction and Engineering Company, by Raymond Van Hemelryck. The latter is a Belgian shipowner who placed contracts for sixteen 3,200-ton wooden steamers with the firms, and is now suing for the return of monies paid on the uncompleted contracts.

Vancouver.—The wooden steamers being built in British Columbia will perhaps be taken over by Sir James Ball, the British Columbia commissioner, for the transportation of the 75,000,000 feet of lumber to the United Kingdom. There is nothing definite known in this connection, but it is understood that the probability of such an arrangement that enabled Sir James to make the announcement that he had the necessary tonnage to move half the order in the next six months.

Victoria.—Bayly Hipkins, vice-president and manager for the North-West district of the Foundation Company, on a recent visit here, made the interesting announcement that the material for the completion of the twenty French ships under contract at the Victoria yard had all been purchased. The Ogden Point plant pleased Mr. Hipkins by the organization displayed, and he expressed himself as confident that the outfitting department would be able to catch and keep up with the construction department.

London.—At the annual meeting of the Cunard Steamship Co. some interesting figures were given. The company lost forty-five ships of a total tonnage of 389,353 tons. They carried during the war 900,000 troops and 10,000,000 tons cargo. The company's engine shop at Bootle on the Mersey was turned into a shell shop, employing 1,000 people, of whom 90 per cent. were women. Over 400,000 shells were turned out here. The company's assets were $75,000,000, and they own or control 558,380 tons gross register, and have 426,800 under construction.

Quebec.—The Minister of Marine, Mr. C. C. Ballantyne, made a visit of inspection here recently. He went first to the yard of the Davey Shipbuilding Co., Lauzon, where two 5,100-ton steamers of the Canadian Government's programme are building, and expressed himself as being well satisfied with the progress made. The minister then visited the Port of Quebec and the Louise Docks, and also inspected the proposed site for the new Government cold storage plant. The minister is taking this question up with the Minister of Finance, and if funds are available the plant will be included in the estimates for the present year.

On May 9th, the S.S. Frater Taylor, under command of Capt. J. D. Montgomery, H. Lavers chief officer, W. T. Rennie chief engineer, left Midland on her fourth trip since the opening of navigation. This is a very fine lake freighter, owned by the Algoma Central Steamship Line, Sault Ste. Marie, Ont.

Since purchasing this vessel from the Gilchrist interests, U.S.A., where she was known as the S.S. Saturn, the Algoma Central have spared no expense in remodelling this vessel and improving the accommodation for the master, officers and crew.

Ottawa.—The Department of Marine has issued a preliminary statement covering the number of vessels and their tonnage built in the Dominion of Canada during 1919. This is, of course, subject to revision. Of wooden craft there were 81 sailing vessels, of a total gross tonnage of 34,042, 43 steam vessels, total gross tonnage 86,479.and 18 internal combustion engine vessels with a total gross tonnage of 9,757. The number and class of steel ships built was as follows: steam driven, 79, with a total gross tonnage of 135,004. The total gross tonnage of wooden and steel vessels built is 265,282 tons, and the total deadweight tonnage is 424,451.

GERMANY'S PRIZE LIE

The frantic anxiety by the Germans to minimize the importance of America's intervention in the war is the best possible evidence we have of the fear they felt. The German papers were full of stories, possible and impossible, of what was happening in America. It is, however, to the German-controlled press in foreign countries that we must turn for the most stupid stories. The sublimest piece of imbecility, however, was the astounding discovery by the Germans that the United States mutinied last October, and the guileless Spaniard is treated to the following exquisitely authentic account of what happened. El Dia starts out with glaring headline, which reads: "Sensational News"—"Important Rebellion in the North American Nation." It then proceeds:—

"Sensational news has reached us of a serious revolt which occurred in the North American Navy about the middle of October last, when three warships arrived in Halifax badly damaged and flying the signal, 'Mutiny on board.'

"One of the ships raised the flag of the Vice-Admiral as an indication that Commodore Dorswell, leader of the rebels, was inviting the naval authorities to come on board, which they did. Immediately the mutineers seized them and then threatened the forts along the waterfront if they did not come to their side. The forts were powerless against the rebellious ships." It is interesting to note that the writer seems to imagine that Halifax is an American port garrisoned by American troops. After capturing all the naval authorities where none exist, El Dia goes cheerfully on:

"In the meantime three battleships and four cruisers surrendered with a loud cheer. When the ships lined up for battle, the Kansas was disabled, and when the crews of the other ships saw this they joined the mutiners."

Apparently, after this comic opera battle, the sailors became as mad as this story, for, we are told:

"The sailors began to commit all kinds of depredations and continued for four hours. They cut the steel cables, which held sixteen partially constructed steel merchant ships, sliding them into the water and sinking them at the entrance to the dykes, which were thus closed for some months. Thirty-eight other hulls, all of them well advanced in the process of construction, were sunk in the channel leading to the arsenals.

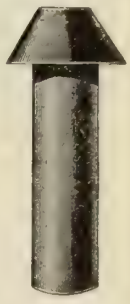
"The Government, though powerless to resist the mutineers, still controlled the censor, but despite their efforts, could not prevent the news arriving in Europe, although, as will be seen, it arrived somewhat late."

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TREMENDOUS WORK OF BRITISH NAVY

The work of Great Britain's "great, silent Navy" in the far East was thus described by Admiral Sir William Grant, K.C.B., British Naval Commander-in-Chief in North America. Speaking at the opening of the Naval exhibit, Sir William said:

"The Navy was at work day in and day out checking German attempts to raise native populations in India and elsewhere, in preventing the formation of raider and submarine bases, and in the general protective measures against mine-laying and raiders of the vast overseas traffic, which included the transport of great numbers of troops from Australia and New Zealand, more than 100,000 Chinese coolies to France, and millions of tons of rice, sugar, oil, wheat, rubber, tin, etc.

Ransacked Asia

"The outlying campaign in Mesopotamia was absolutely dependent on the Navy for transport of troops and all supplies overseas. Rivers had to be dredged, wharves and piers built and railways laid. Japan, China, Hong Kong, Siam, Straits Settlements and India, were ransacked for tugs, and small craft; Burma, Sumatra, and Borneo for hundreds of thousands of tons of lumber, and India for railway material and coal.

"The same countries sent large supplies to the Saloniki armies and still larger of timber, petrol, and what not to the armies in Egypt and Palestine. In German East Africa the same story held good."

Speaking of the work of the British and American Navies in transporting the American army, a task which he declared was "one of the most remarkable feats of organization and endurance known in the world's history," Sir William said that while transports and cargo ships "have been exposed to every devilish device the enemy could invent," and had suffered great loss, "we must not forget the price is being paid by the women and children of Great Britain, who are living on the barest allowance of food in order to free the necessary ships."

SHIPBUILDING IN AUSTRALIA

Canada and the United States are making great progress in shipbuilding and there is a movement of the same kind in Australia at present. The Commonwealth has a huge surplus of foodstuffs stored, which it is unable to ship. In order to clear the docks of 1915-18 wheat harvests, it would require an exportation of 900 shiploads.

Shipbuilding being a new venture in Australia, extensive industrial mobilization was required. Mr. Hughes, Prime Minister, held a conference with the labor unions, and an agreement was reached which produced the necessary co-operation. Ship constructors and experts were obtained from Great Britain. The industry has its basis in natural resources, and is likely to be permanent.

HYDROPLANES AS AID IN FISHING

Patrolling hydroplanes have proved during the war that it is possible for aircraft to locate submarines even when they are submerged. The observers declare that the course taken by a shoal of fish is equally discernible. The suggestion has been made that the hydroplane can effectually help the fishing smack to reap the great harvests of the sea. The patrolling planes, having located a shoal, could report the locality by wireless and indicate the direction taken by the fish.

Along the Cornwall coast longshoremen watch day and night for the appearance of the pilchard. The number taken in nets is astonishing. On one occasion there were enclosed in the nets 7,000 hogsheads, each containing 35,000 pilchards. This catch alone yielded 245,000,000 pilchards. The missing of such a gigantic shoal may bring poverty to hundreds of men and women engaged in sorting and picking.

The appearance of the shoal is now heralded by the birds and larger fishes.

SEA GULLS DETECT U-BOATS

Great Britain was aided in hunting down the U-boats by the sea gulls. So useful did the gulls prove that there was a law passed which fixed a severe penalty for the destruction of the birds.

The gulls will cluster around a vessel in the Irish Sea, for instance. If a submarine appears they will flock to the spot where there is commotion on the surface of the ocean.

The antics of the gulls are observed by the navigating officers on the ship and the armed guard prepares for action. In many cases when the gunners have fired at a spot over which the gulls were hovering they have discovered that a submarine was preparing to come to the top and take an observation. The gulls are never attracted in great numbers to a spot unless there is a big run of fish. The sailors explain that the gulls are attracted to the German submarines because the dark blotch cast on the water represents a large school of fish swimming close to the surface.

All along the dockyards and waterfronts in Great Britain placards are placed informing the fishermen that "the sea gull is a great big voluntary friend of Great Britain in her fight against the U-boats."

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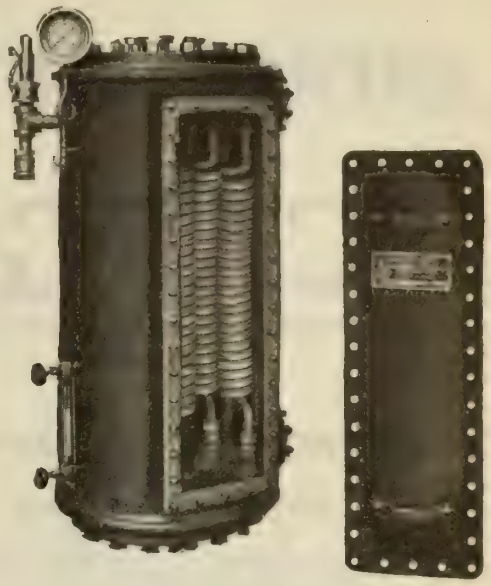
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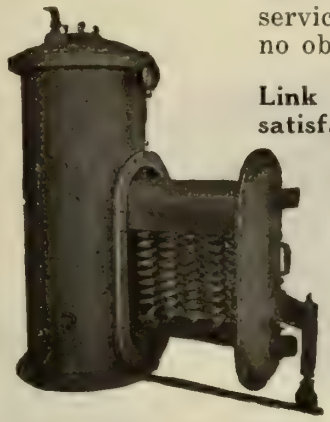
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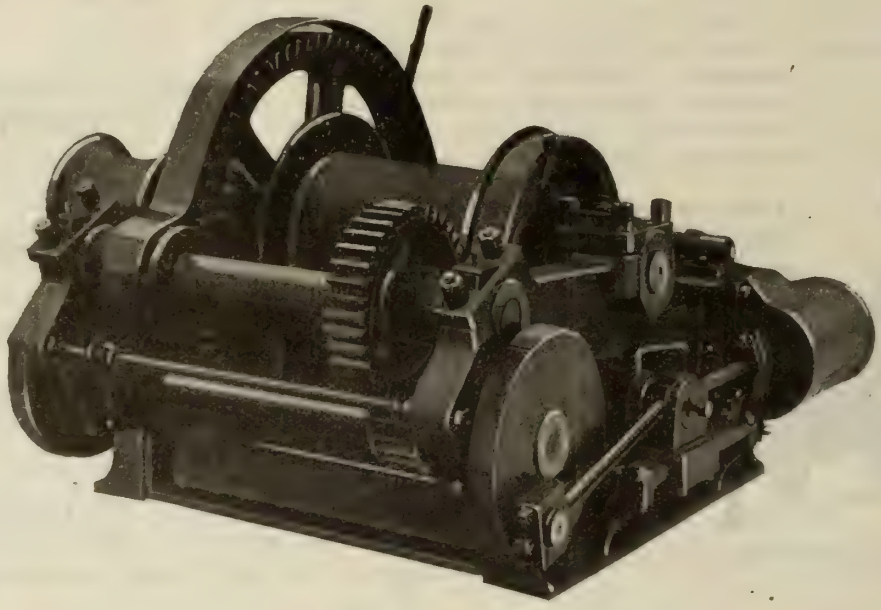
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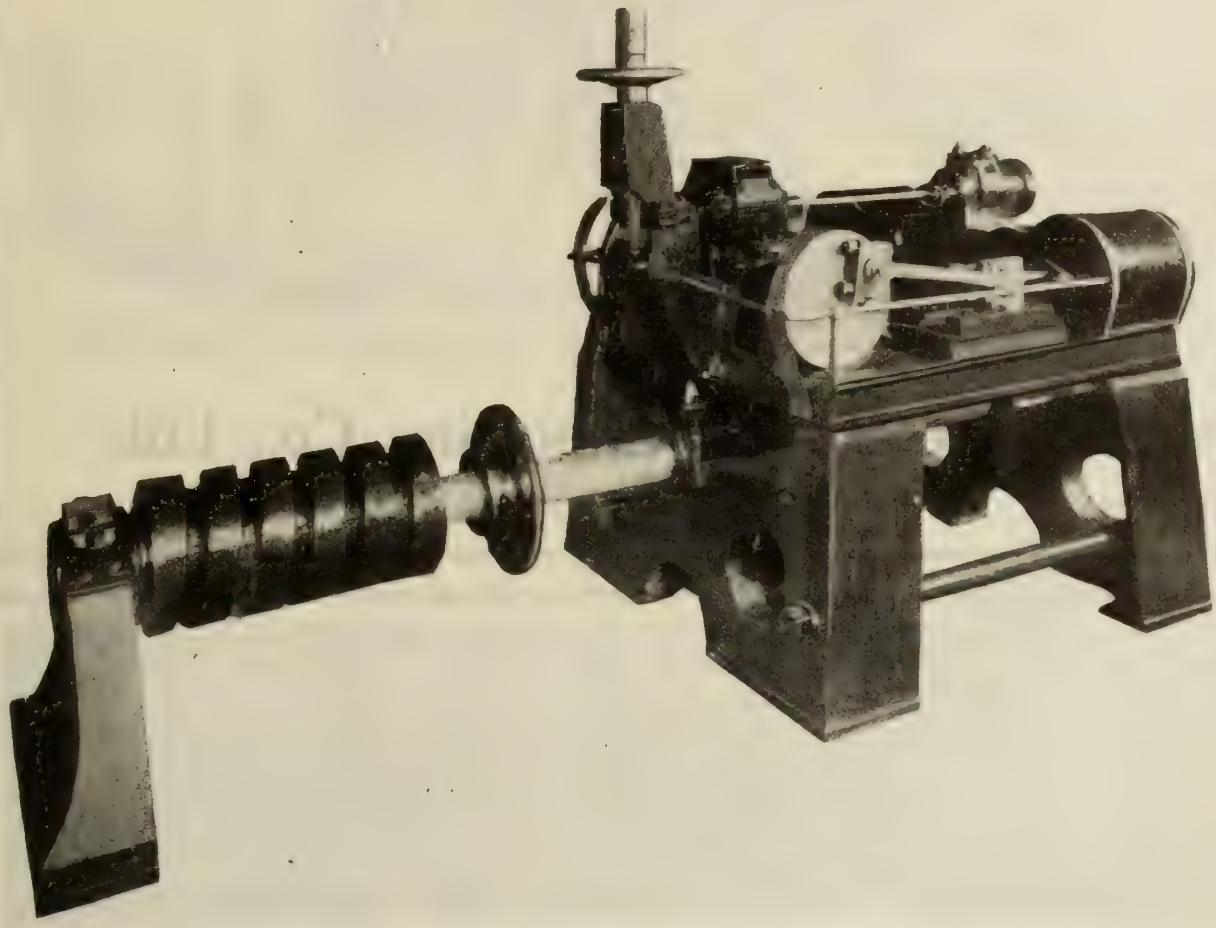
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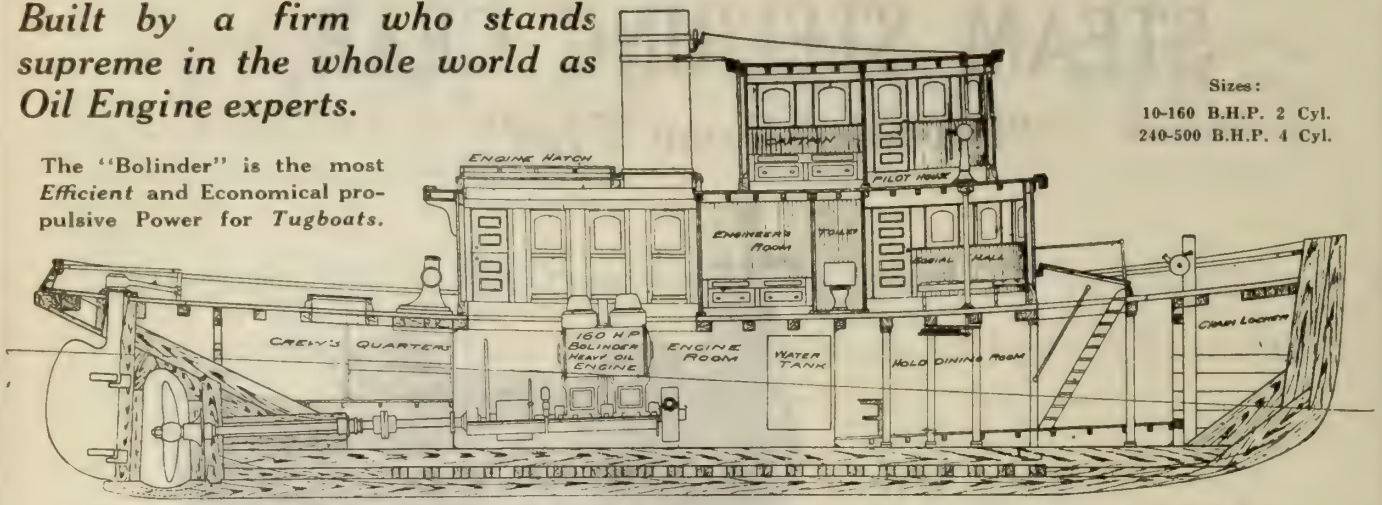
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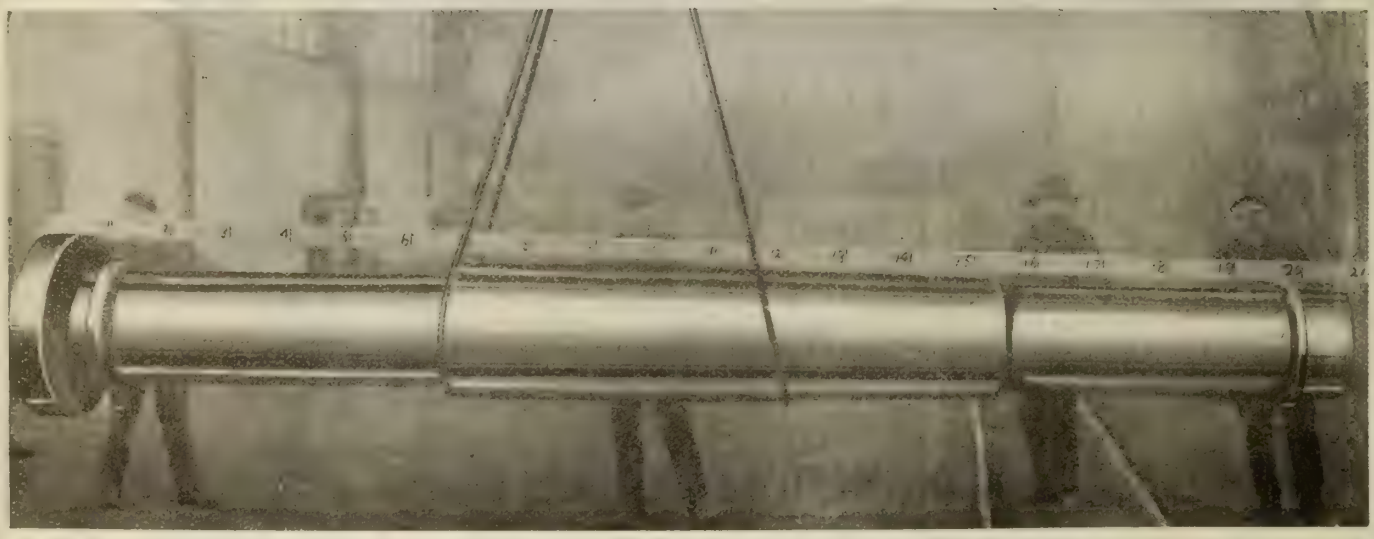


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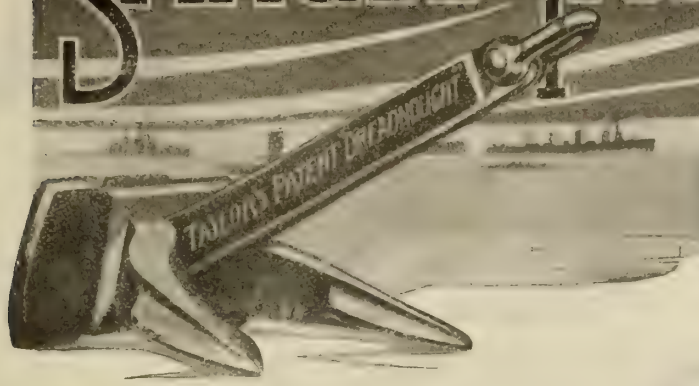
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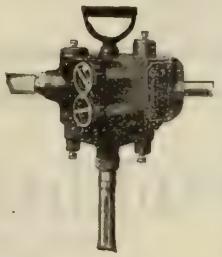
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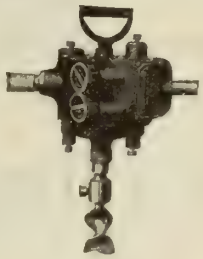
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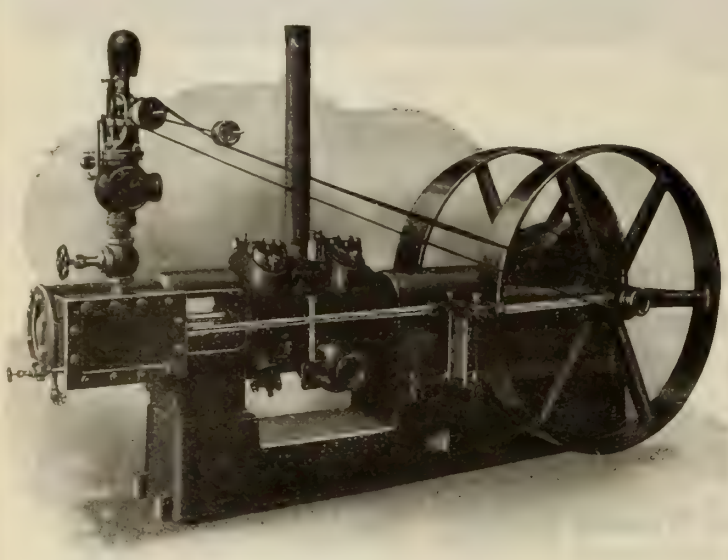
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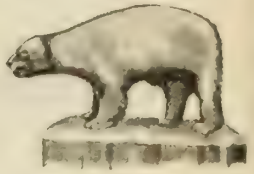
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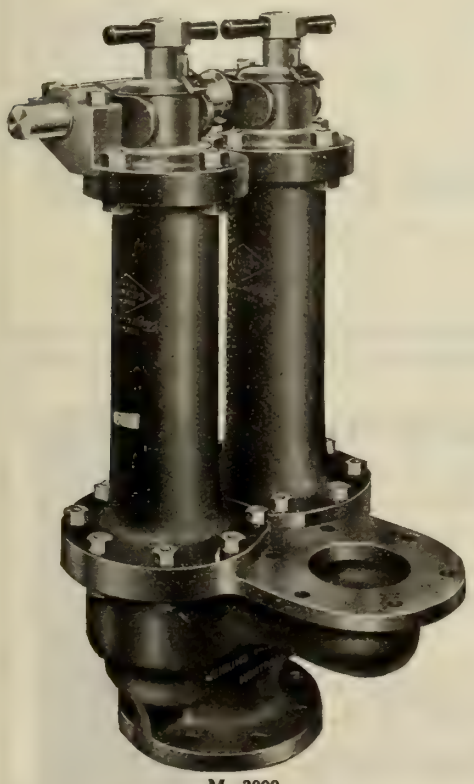
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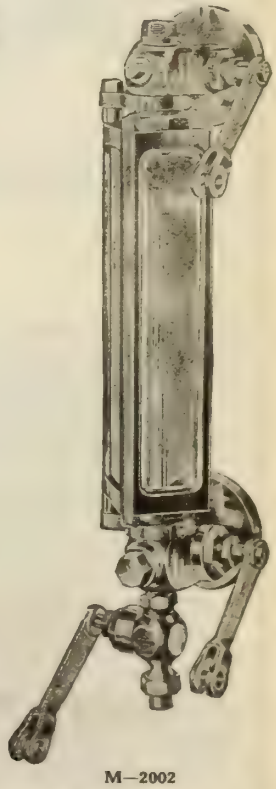
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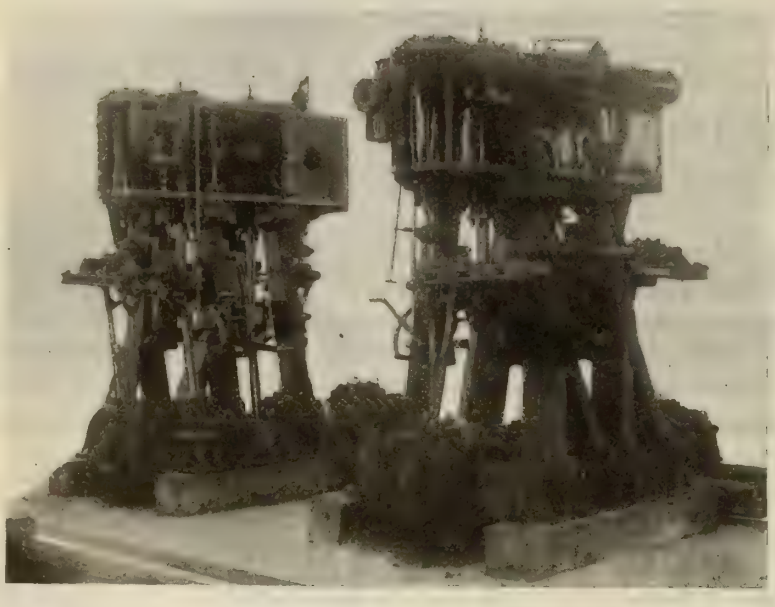


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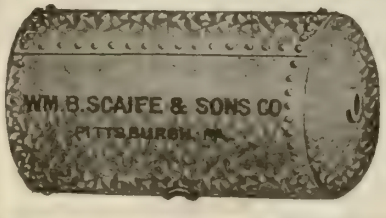
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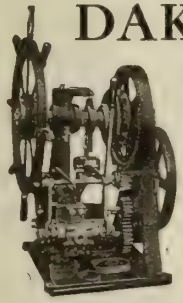
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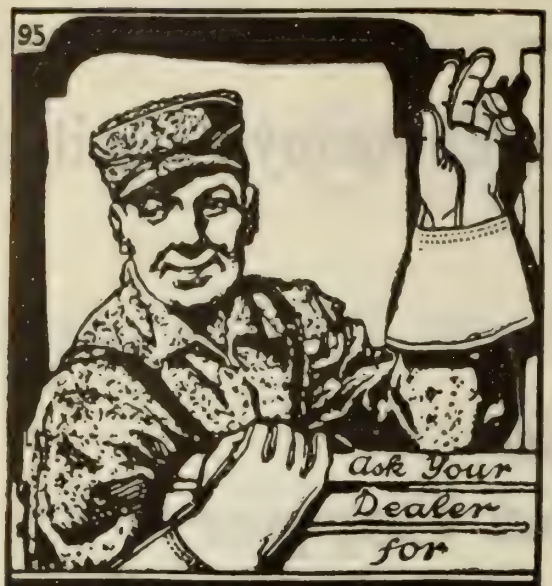
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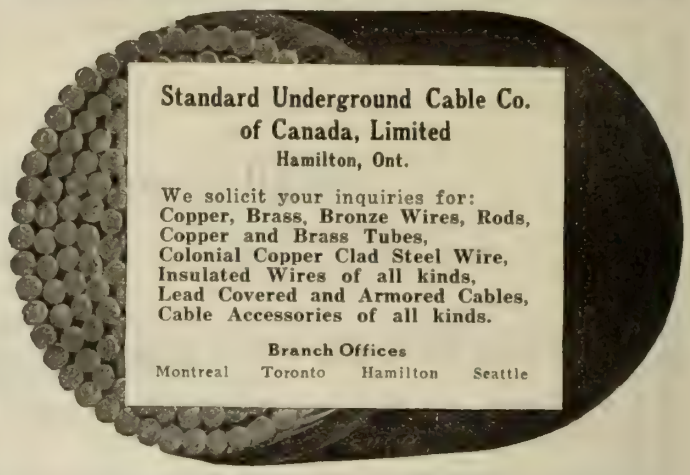
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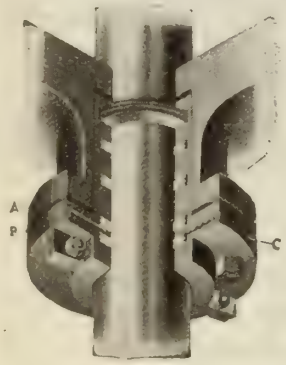
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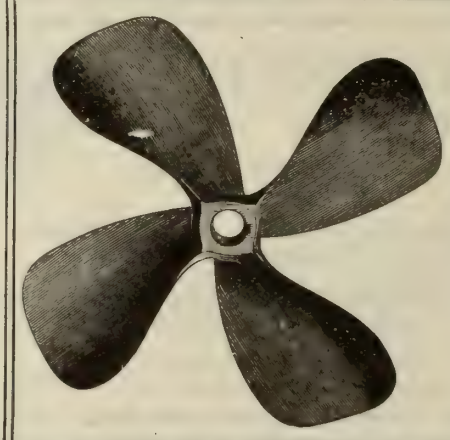
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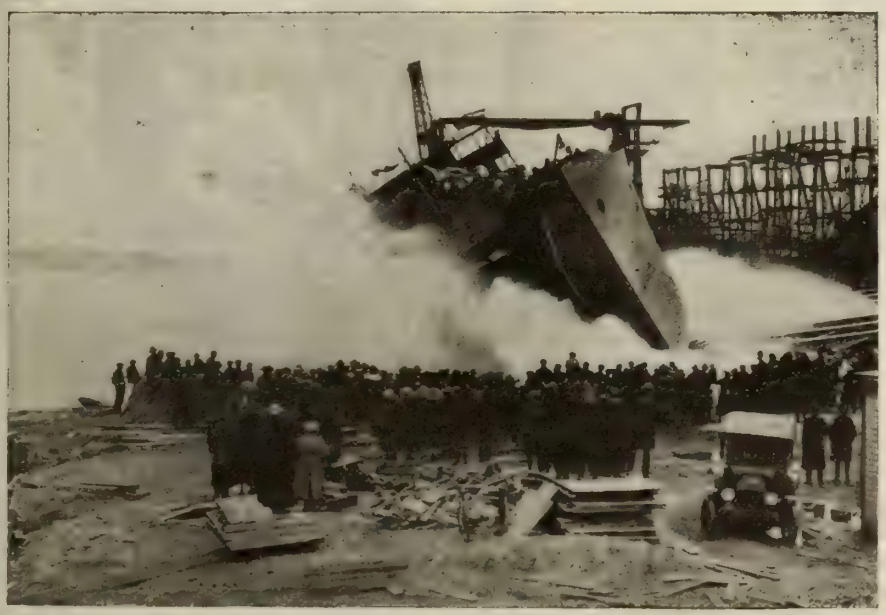
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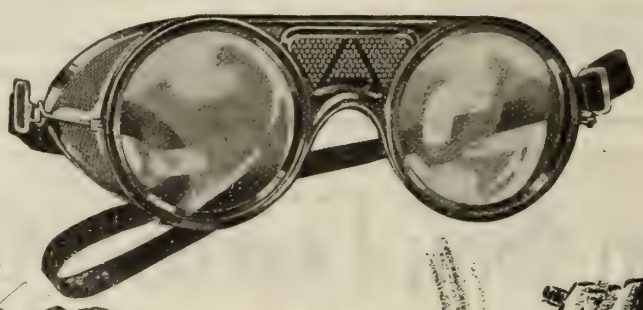
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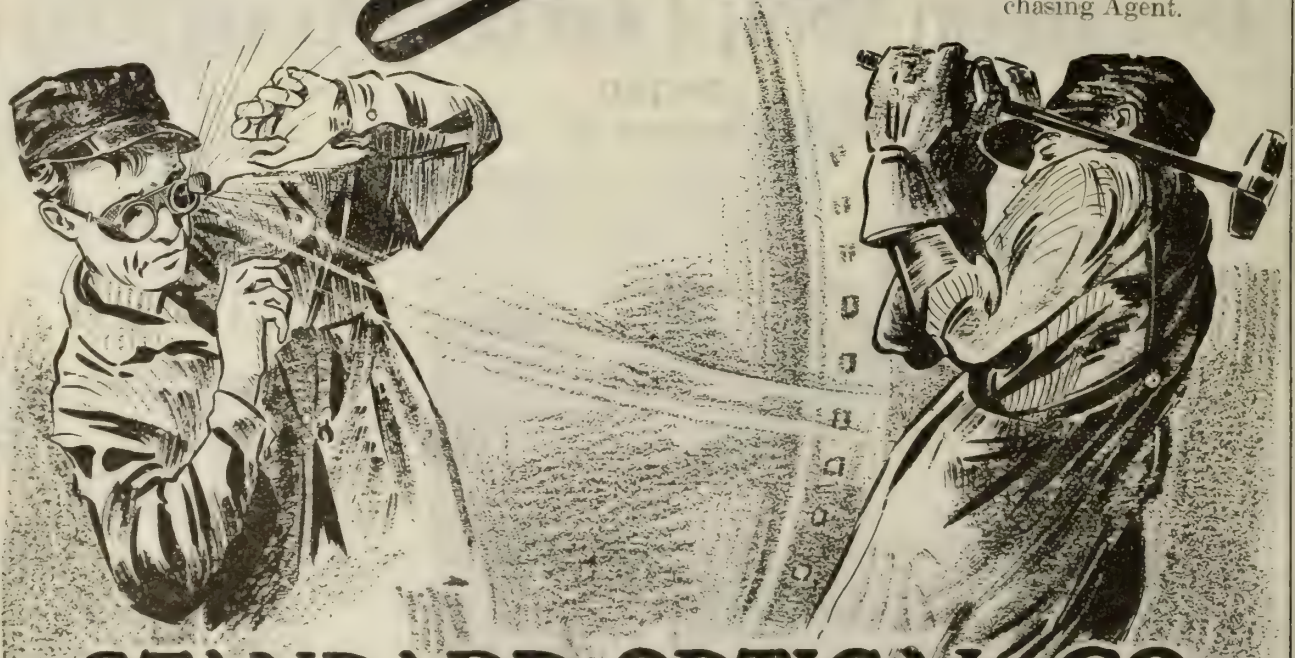
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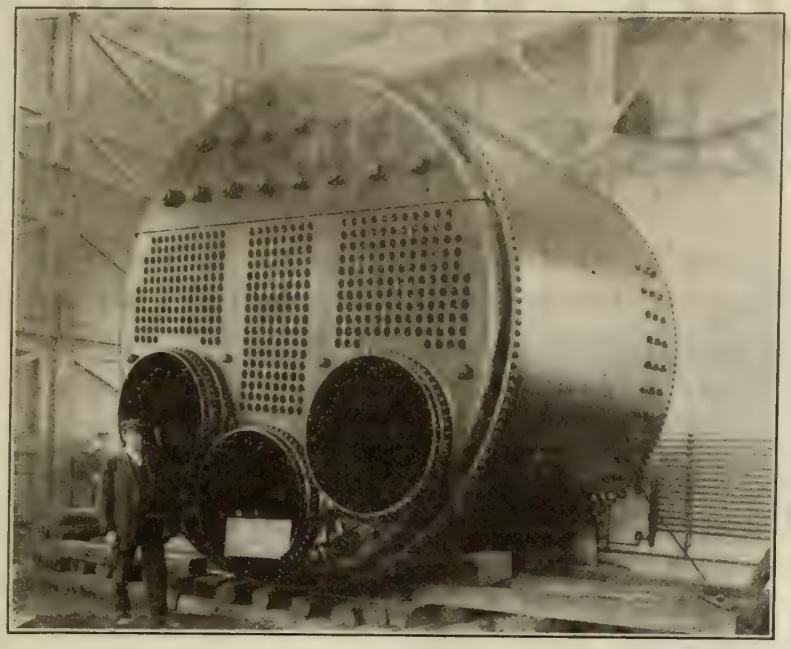
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Other National Features of This Issue

"Victory Stuff" By Robert W. Service.

"Solving the Problem of the Arctic" By Vilhjalmur Stefansson.

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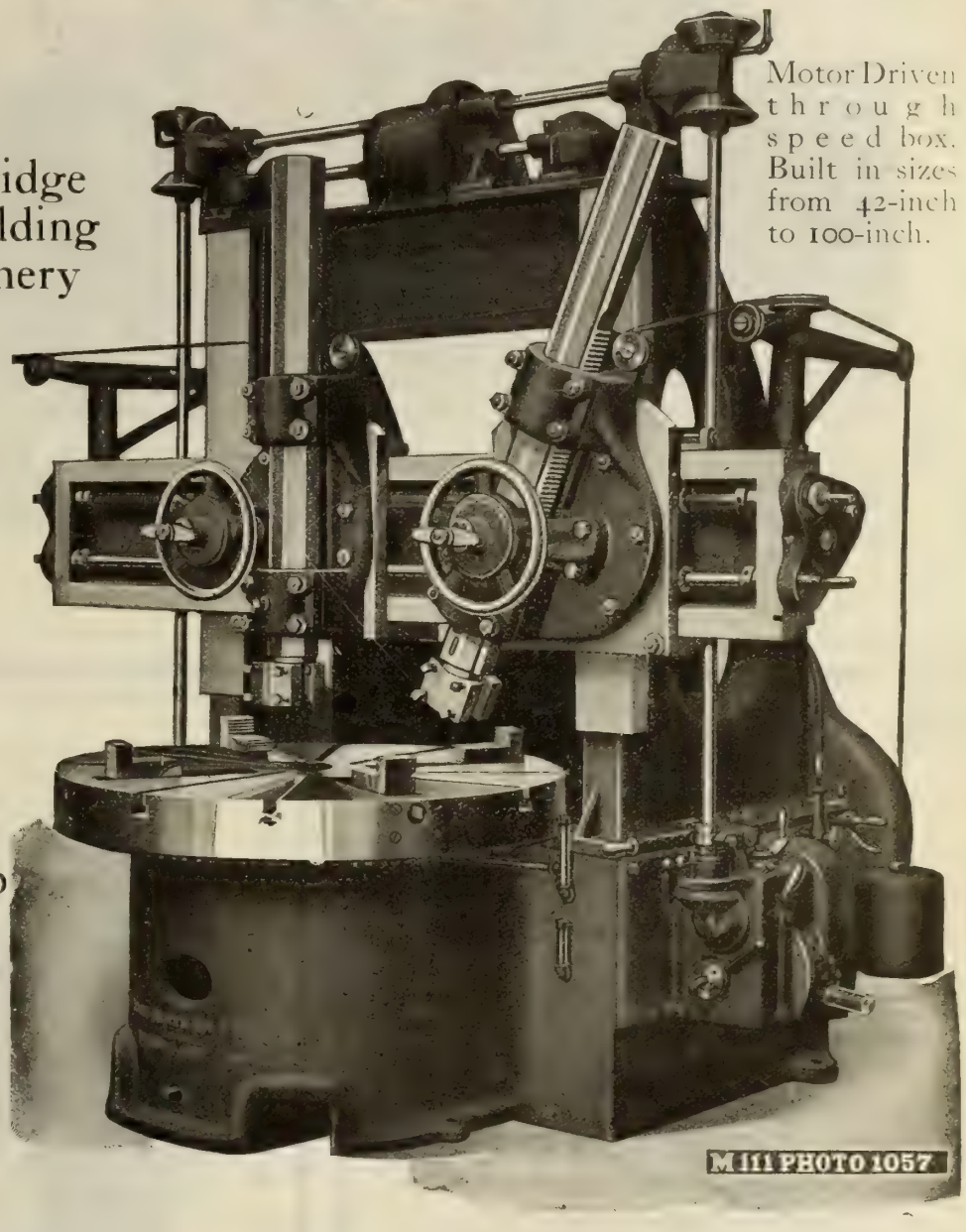
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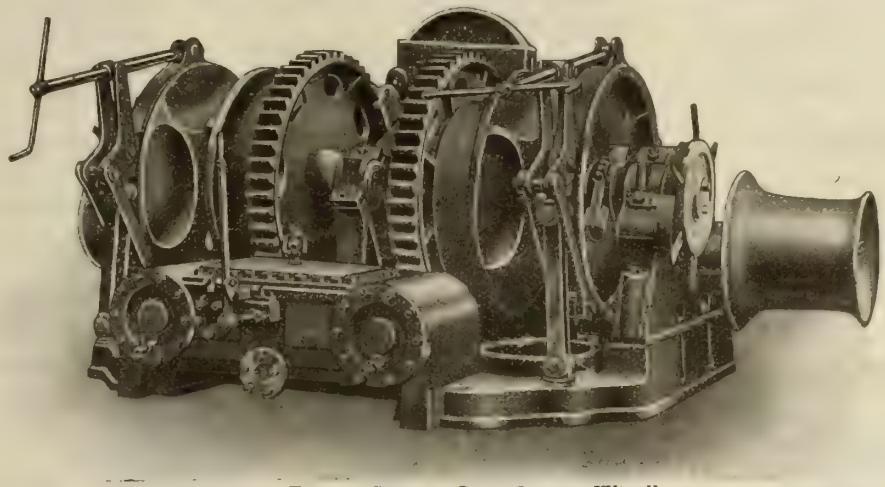
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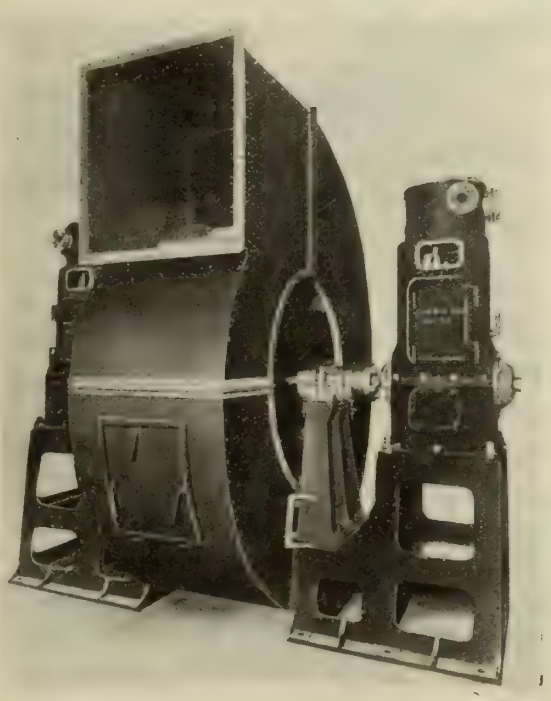


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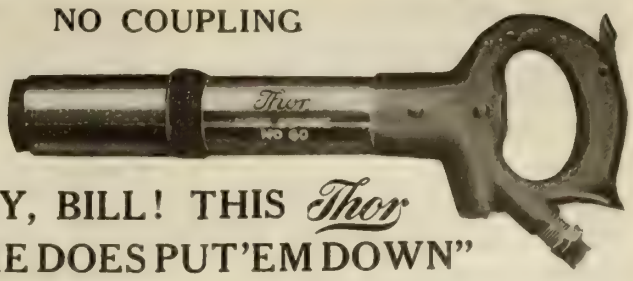
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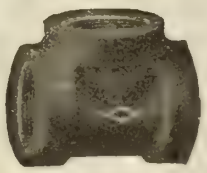
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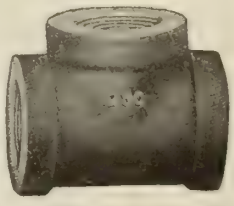


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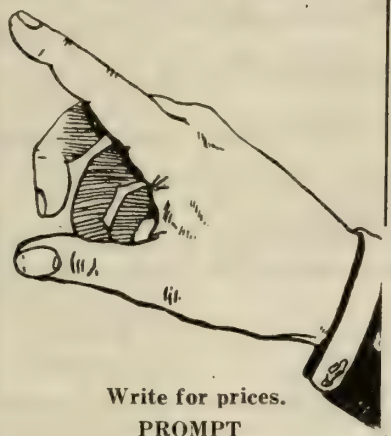
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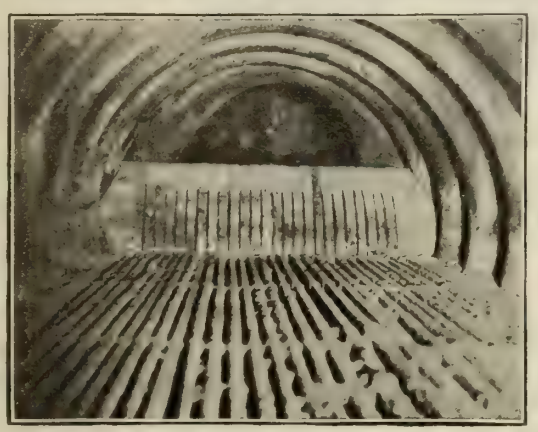
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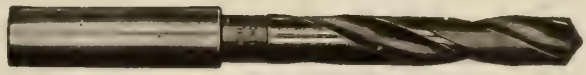
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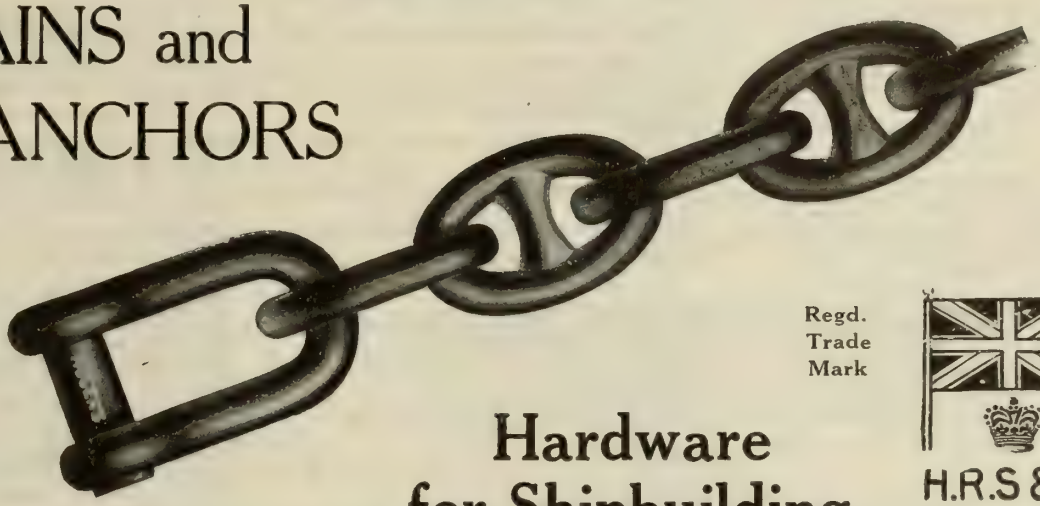
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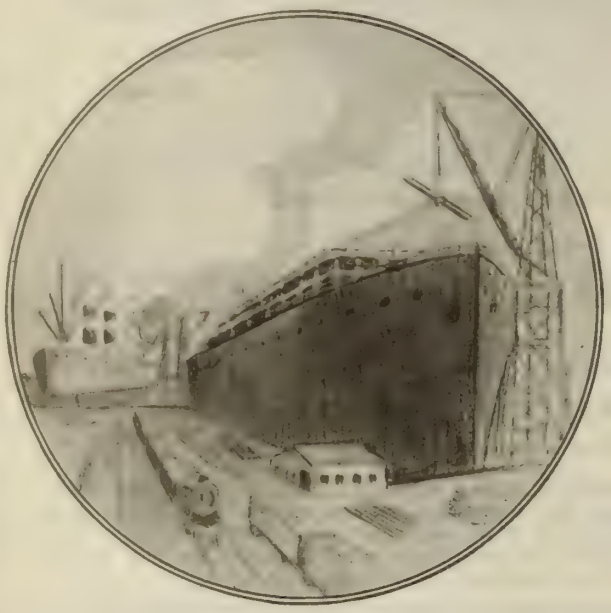
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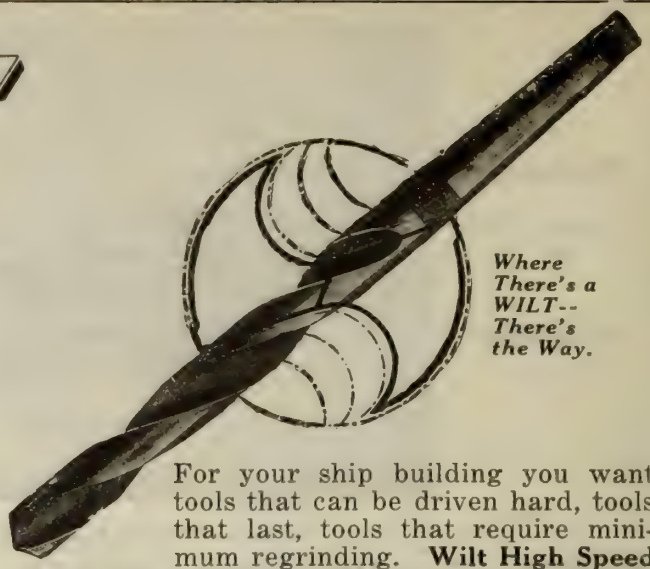
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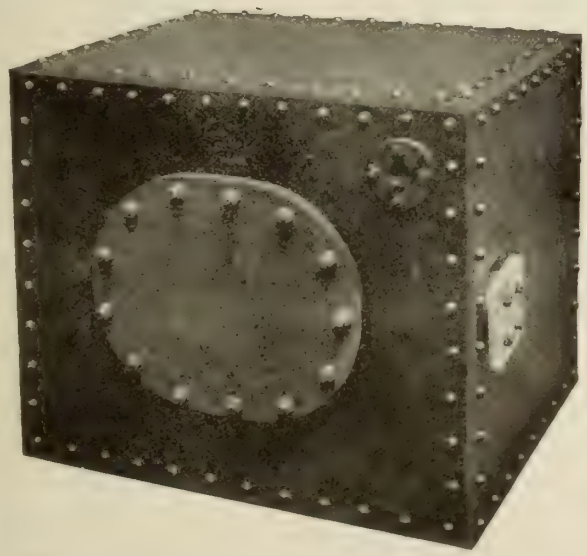
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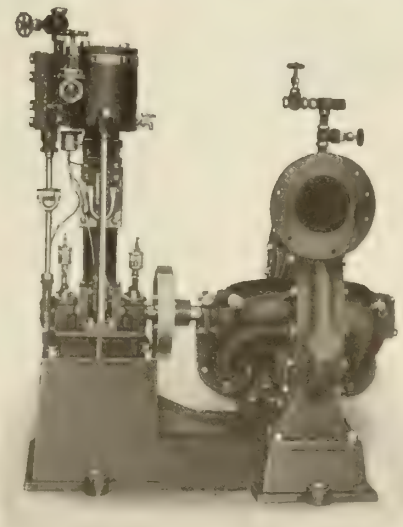


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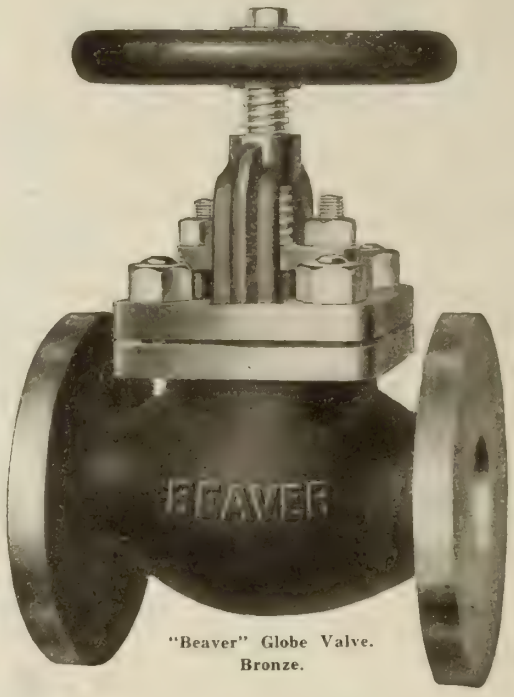
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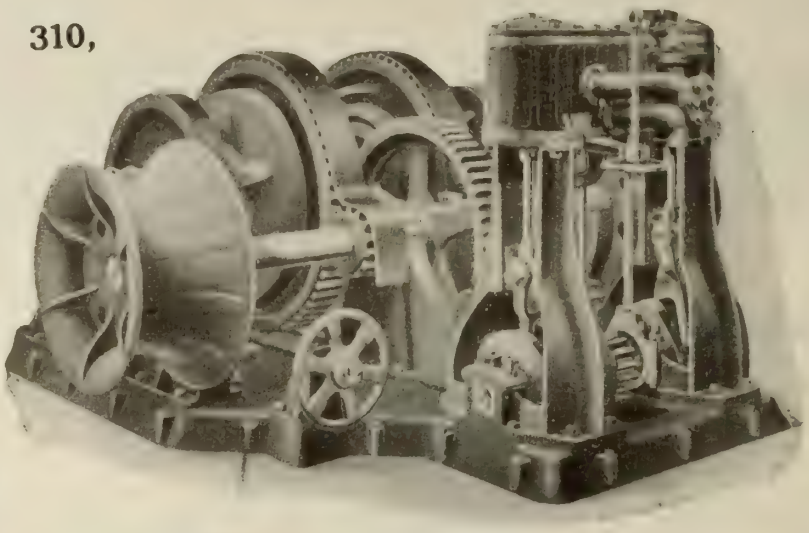
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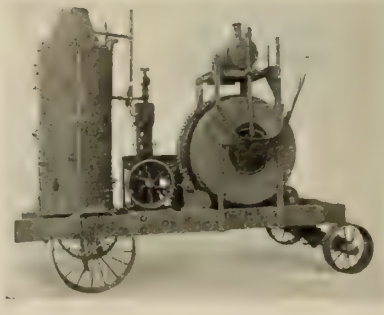
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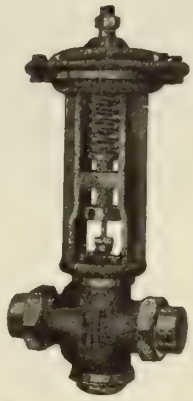
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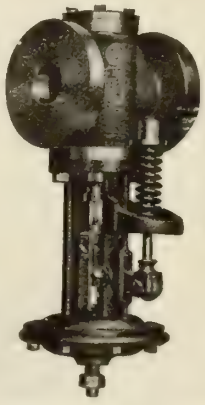


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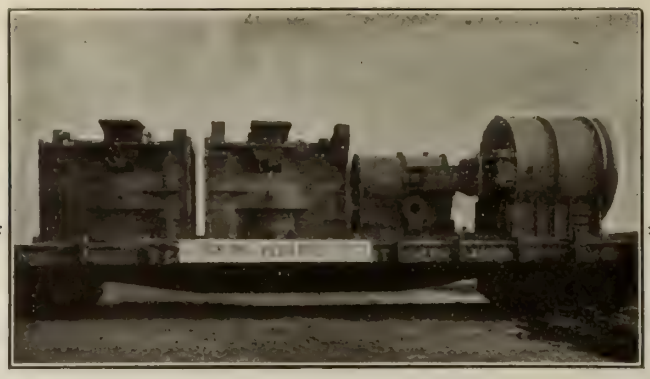
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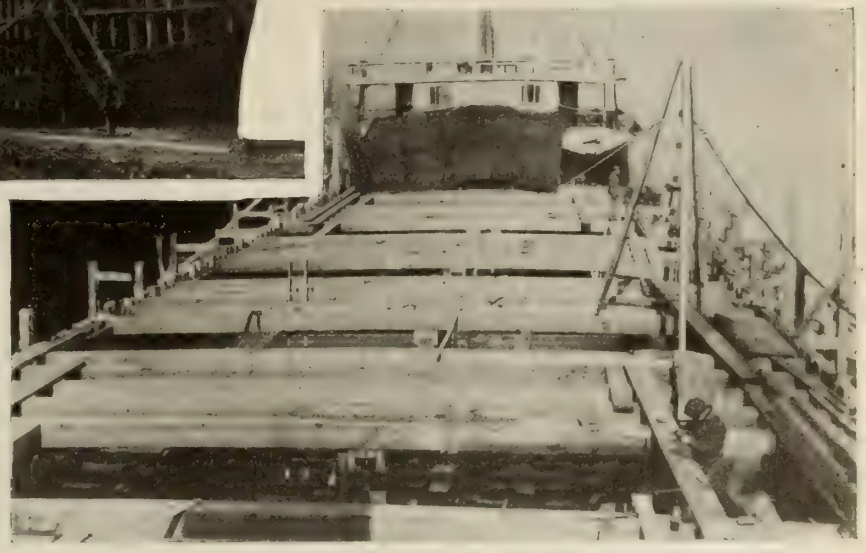
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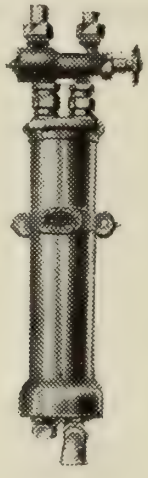
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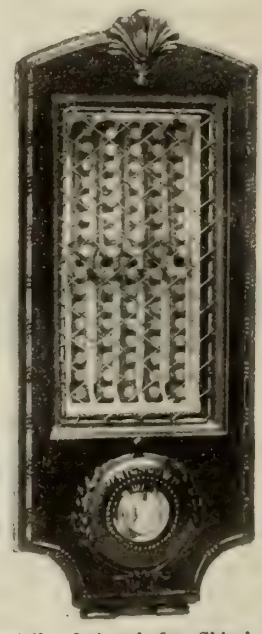
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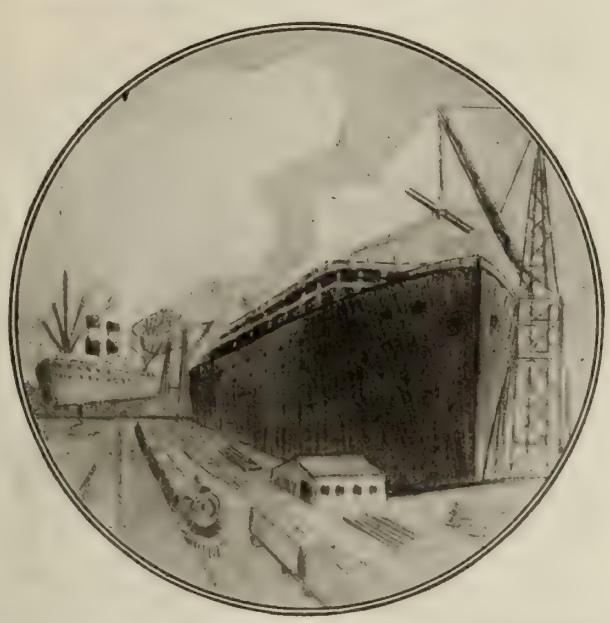
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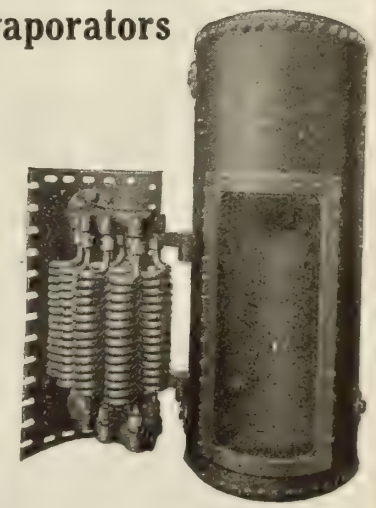
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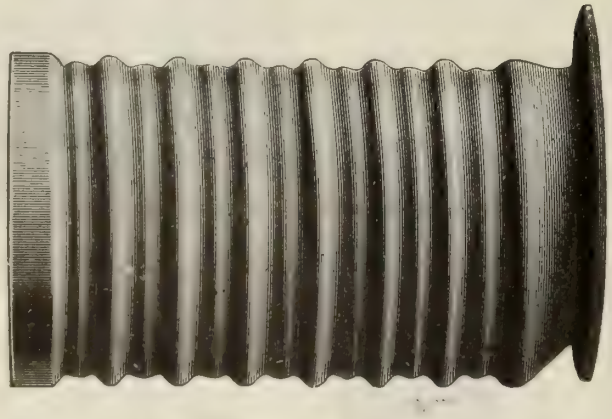
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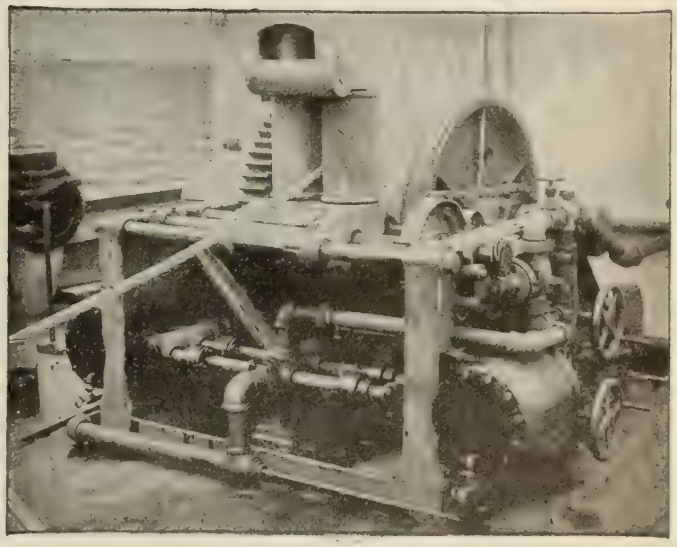
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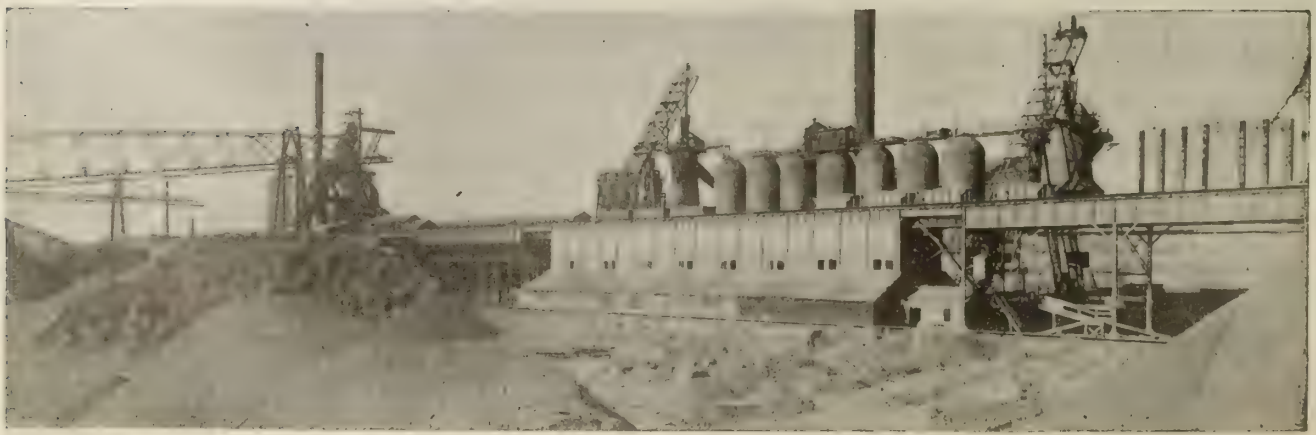
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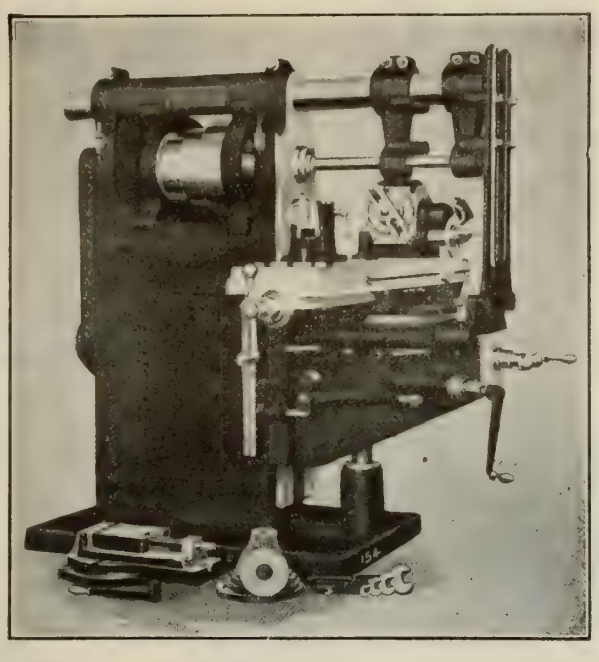


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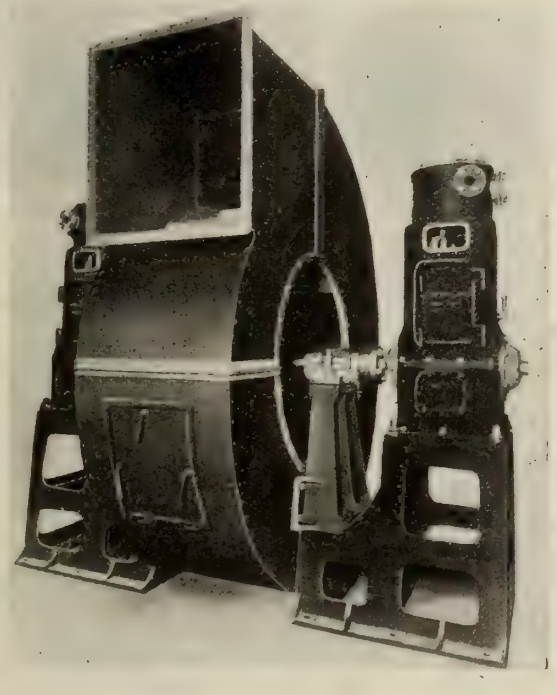
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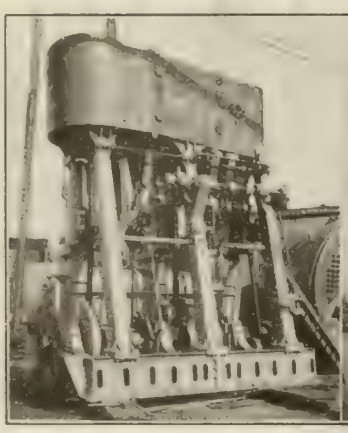
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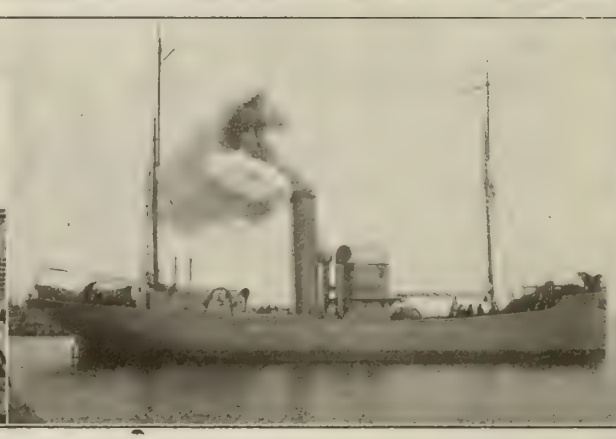
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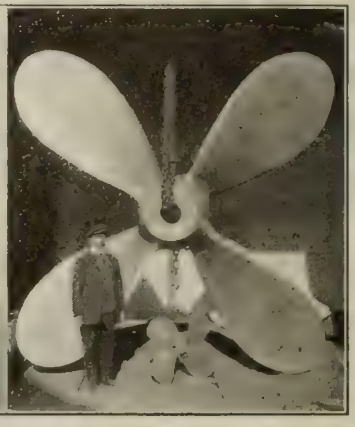
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MARINE ENGINEERING
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Canadian Merchant Service Guild Review

Volume IX. TORONTO, JULY, 1919 Number 7

Crude Oil Motors vs. Steam In Marine Practice

The Relative Advantages and Otherwise Are Presented and Discussed—Various Types of Motors—Two and Four-Stroke Cycle—Lubrication Piston Cooling — Paper Read Before the A.S.M.E.

By J. W. MORTON

THE number of articles which have appeared of late describing the performances of the so-called motorships would seem to indicate that for marine purposes the crude-oil motor is rapidly replacing the steam engine. The chief reason for this is not to be found, as might be expected, in the lower operating cost of the crude-oil motor, but is rather due to other factors which, when considered, lead to the conclusion that the crude-oil motor is probably the most economical prime mover of to-day.

2. Perhaps the correctness of this statement can best be shown by comparing a steamship with a motorship. In the case of a war vessel, for instance, there are eight factors which ought to be considered in choosing the form of motive power, namely weight, space occupied, radius of operation, preparedness, fuel, crew necessary, auxiliary equipment, and cost.

3. The weight of the power plant is of great importance, for a saving therein can be utilized to increase the armor of the ship. If, for example, a warship of 3,500 tons displacement be equipped with crude-oil motors there will result a saving as indicated by Table 1, which is based on a single steam engine developing 4,400 h.p. and 3 units, of 1,600 h.p. each, of a standard make of crude-oil motor.

4. In the case cited about the same space would be required for both motor plant and steam plant, but the total horsepower could just as well be developed by two units of slightly larger size, and if this were done, approximately one-third the space would be saved. Moreover, if oil motors were used the space occupied by the coal bunkers could be partially released, as crude oil can be stored in tanks under the engine floor and below the protective line.

5. It is obvious that a warship must possess a great cruising radius, and if weight for weight of engines be considered then the ratio R of the cruising radii of a steamship and a motorship may be expressed by the formula:

TABLE 1. COMPARATIVE WEIGHTS OF POWER PLANTS IN STEAMSHIPS AND MOTORSHIPS.

	Steam-ship	Motor-ship	Savings in motorship, weight, tons	P.C.
Engine, tons	335	264	71	...
% of displacement	9.6	7.5	...	2.1
Fuel, tons	246	86	160	...
% of displacement	7.0	2.5	...	4.5
Crew, provisions, water, tons	91	82	9	...
% of displacement	2.6	2.3	...	0.3
Totals.....	672	632	240	6.9

$$R = \frac{Vc \times Ho \times Wc}{Vo \times Hc \times Wo}$$

where

Vc=cu. ft. occupied per ton of coal=45
Vo=cu. ft. occupied per ton of oil=35
Hc=B.t.u. per lb. of coal =14,000
Ho=B.t.u. per lb. of oil =18,500
Wc=lb. coal consumed per e.hp.-hr.
Wo=lb. fuel oil consumed per e.hp.-hr.

In the case of the warship under consideration if Wc be taken as 1.75 and Wo as 0.4, then the ratio will be

$$R = \frac{45 \times 18500 \times 1.75}{35 \times 14000 \times 0.4} = 5.7$$

The cruising radius will, of course, vary with the type of engine and ship, but nevertheless the average ratio, as expressed above, may be taken at least as 1 to 5 in favor of the crude-oil motors.

6. A motorship in sharp contrast to the steamship is always ready for action as no time is lost getting up steam. Moreover, fuel is consumed only when the motors are running, and the motorship is capable of maintaining full speed as long as there is a supply of fuel.

7. As there is no need for stokers on a motorship, the crew can be decreased about 10 per cent., and this of course permits of a corresponding saving in provisions, water storage and quarters.

8. In the case of a steam-driven warship the smoke from the stack frequently betrays the location of the ship, for it is well known that a vessel can be easily located by its smoke long before the masts or hulls are in sight. Another drawback to the steam-driven warship lies in the fact that the smoke covers the ship with a film of soot which, getting into vital parts of auxiliary machinery, necessitates frequent cleaning and unnecessary wear and tear. On the other hand, when oil is used there is no smoke, the handling of the oil is both cleaner and easier, and the life of machinery and equipment is greatly increased.

9. When a change is made from steam to oil the auxiliary machinery is usually electrically driven, as this has been found to be most satisfactory. The dynamos are usually driven by separate oil motors. Hot water for heating and sanitary purposes is obtained from a small oil-fired boiler, and while the first cost of such installations are high, they are in time offset by the lower operating costs.

10. Prior to the war the first cost of a crude-oil motor plant was approximately twice that of a steam plant. This was partly offset, however, by the savings in operating expenses, under which item comes cost of fuel, labor and supplies. The cost of fuel naturally depends upon the prevailing market for coal and oil. In regard to maintenance there is practically no information available as the crude-oil motor is still in its infancy so far as this country is concerned.

Cargo Ships

11. Many of the preceding statements concerning the installation of crude-oil motors on battleships can also be properly applied to cargo ships. During the last four years a number of such vessels have been equipped with crude-oil motors of both the two-stroke and four-stroke cycle type, and while engineers are not agreed as to the best type, the four-stroke cycle is to be preferred.

12. One of the most successful installations of this kind is that on the motorship "Suecia." This ship has a length

of 362 ft., a beam of 51 ft. 3 in., a depth of 25 ft. 6 in., and a capacity of 6,550 deadweight tons. It is provided with twin screws, driven by two 1,000 h.p. Diesel engines of the 8-cylinder, 4-cycle type, and also with two auxiliary engines of 200 h.p. each. The vessel was built for service between Sweden and La Plata, and its first run was a test made on December 4, 1913. The curves in Fig. 1 give some idea of the characteristics of the motors. The dotted curves are given for the sake of a comparison with the steamship "Princessan Ingeborg," built two years before the "Suecia" and for the same company. The "Princessan Ingeborg" has a length of 300 ft., a beam of 48 ft. 9 in., a depth of 22 ft. 4 in., and a capacity of 5,890 deadweight tons. The block coefficient for the "Suecia" is 0.78, and for the "Princessan Ingeborg" 0.794, and thus both vessels are about equal in size and that the steamship has less horsepower.

14. The fuel consumption during the trial trip of the "Suecia" was 0.2948 lb. per i.h.p., or 0.3685 lb. taking the mechanical efficiency at 80 per cent., a very satisfactory value. Table 2 affords a comparison of this vessel with other motorships.

Motor Sizes

15. The horsepower of a crude-oil motor, whether of the constant-volume or constant-pressure type, is somewhat limited by practical considerations of construction. At the present time the maximum size is 2,500 h.p. per shaft and from six to eight cylinders for the two and four-stroke cycle constant-pressure type, although some experimental engines have been built as large as 6,000 h.p. This is in sharp contrast, however, to the power developed by steam, which runs as high as 15,000 h.p. for the steam

18. On the other hand, the constant-pressure oil motor of high power must have numerous cylinders all of the same size and the high pressure, which lasts approximately 10 per cent. of the stroke, necessitates a careful design of the crank mechanism. This applies especially to the crankshaft, which is both difficult and costly to produce. Moreover, in motors with only a few cylinders the flywheel must be heavy, large and expensive if a great variation in speed is to be cared for. Difficulties have also been encountered in keeping the piston leak-proof—if it fits too tightly the result is a large frictional loss, and if the clearance is too great there will be a loss of pressure. The greater the piston area the more effective must be the cooling system as the surface exposed per pound of working medium decreases as the cylinder dimensions increase. This accounts for the lower thermal

TABLE 2. DATA ON VARIOUS CARGO MOTORSHIPS
(Number of main motors on each ship—2)

			Hull.					Machinery.							
Name of Ship.	Year placed in service.	Owner.	Length ft.-in.	Beam, ft.-in.	Depth, ft.-in.	Capacity, deadweight tons	Speed in knots	Total i.hp.	No. of cylinders in each motor	Bore, mm.	Stroke, mm.	R. p. m.	Ratio of Stroke to bore	Piston speed, meters per min.	M. e. p., kg. per sq. cm.
Suecia	1912	Nordstjernan...	362-0	51-3	25-6	6550	10¾	2000	8	500	660	140	1.32	185	6.2
Selandia*	1912	East Asiatic Co..	370-0	53-0	30-0	7400	12	2500	8	530	730	140	1.38	204	6.2
Pedro Christophersen	1913	Nordstjernan...	362-0	51-3	26-6	6550	10¾	2000	8	500	660	140	1.32	185	6.2
Siam	1913	East Asiatic Co..	410-0	55-0	30-6	9700	11¼	3000	8	590	800	125	1.36	200	6.2
Annam	1913	East Asiatic Co..	410-0	55-0	30-6	9700	11¼	3000	8	590	800	125	1.36	200	6.2
Kronprins Gust. Adolf	1914	Nordstjernan...	362-0	51-3	25-6	6550	10¾	2000	6	540	730	140	1.35	204	6.4
California	1913	United Stsp. Co.	405-0	54-0	35-0	7250	11¼	2600	8	540	730	140	1.35	204	6.2
Kronsan Margareta	1914	Nordstjernan...	362-0	51-3	25-6	6550	10¾	2000	6	540	730	140	1.35	204	6 4
Fionia*	1914	East Asiatic Co..	395-0	53-0	30-0	6700	13½	4000	6	740	1100	100	1.49	220	6.34
Malakka	1914	East Asiatic Co..	410-0	55-0	30-6	9200	11¼	3100	6	630	960	125	1.525	240	6.2
Tongking	1914	East Asiatic Co..	410-0	55-0	30-6	9200	11¼	3100	6	630	960	125	1.525	240	6.2
Pacific	1914	Nordstjernan...	362-0	51-3	25-6	6550	10¾	2000	6	540	730	140	1.35	204	6.4
San Francisco	1915	Nordstjernan...	362-0	51-3	25-6	6550	10¾	2000	6	540	730	140	1.35	204	6.4
Panama	1915	East Asiatic Co..	410-0	55-0	30-6	9200	11¼	3100	6	630	960	125	1.525	240	6.2
Australien	1915	East Asiatic Co..	410-0	55-0	30-6	9200	11¼	3100	6	630	960	125	1.525	240	6.2
Columbia	1915	East Asiatic Co..	425-0	55-0	30-6	9500	11.15	3100	6	630	960	125	1.525	240	6.2
Chile	1915	East Asiatic Co..	425-0	55-0	30-6	9500	11.15	3100	6	630	960	125	1.525	240	6.2
Oregon	1915	United Stsp. Co.	405-0	54-0	36-6	8270	11.0	2800	6	590	900	140	1.525	252	6.1
Peru	1916	East Asiatic Co..	425-0	55-0	30-6	9500	11.15	3100	6	630	960	125	1.525	240	6.2

*Cargo and passenger vessel.

Average 6.24

excellence. A comparison will show that the same amount of power is necessary to obtain equal speeds when the displacements are equal. This would seem to indicate that there is no difference between transmitting power through two small comparatively fast-running screws as is done on the motorship, and transmitting power through a single slow-running screw as in the case of the steamship. The propeller on the steamship has a diameter of 17 ft., while those of the motorship are only 10 ft. The ratio of indicated to effective horsepower is therefore the same for both ships, and the total efficiency of engines and propellers is also about the same.

13. In order to correspond to the motorship in horsepower the steamship would be obliged to carry an extra boiler. This would increase its weight 570 tons, whereas the weight of the machinery on the motorship is only 470 tons. The length of the engine room of the motorship is 41 ft., while the length of engine room and necessary boilers in the steamship is 66 ft., and this despite the fact engine and 35,000 h.p. for the steam turbine.

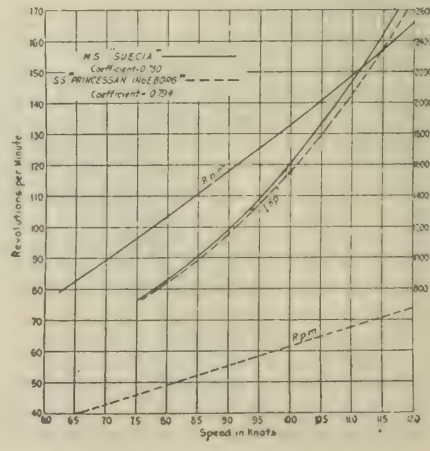
16. Crude-oil motors of small horsepower are usually of the high-pressure type, medium, so-called semi-Diesel or hot-bulb type and two-cycle constant-volume type. Prominent among such semi-Diesel engines are the Bolinder, Scandia, Avance, Alliance, Tuxham, Gidion and Holm.

17. It has been proved both by experiment and practice that the constant-volume, high-power, single-cylinder type of motor is unsatisfactory, and chiefly because of the fact that the enormous heat generated at the pistons during the explosion must travel a great distance before it is transferred to the water jacket, and as a result the central part of the piston is heated to such an extent that pre-ignition frequently occurs. Furthermore, the sudden rise in pressure sets up detrimental vibrating stresses in the material, and it is also exceedingly difficult to obtain a proper mixture of air and oil, rapid ignition and complete combustion and exhaust.

efficiency and the horsepower available per unit of piston surface with large cylinders.

Low-Power Motors

19. Advantages.—The efficiency of an oil motor is greater than that of a steam engine, especially in small units, and



furthermore it decreases less with increasing load. The fuel consumption of an oil motor is independent of the attendant's skill as it shows the same value in daily work as on a test stand. With a steam engine, however, the fuel consumption is dependent upon the attendant and especially the stokers, who must be experienced. In steam plants the boilers and pipes must be able to withstand high pressures and temperatures, but with oil motors a high pressure exists only in the cylinder and a few small pipes. Moreover, the oil motor is simpler in construction, and the weight and space occupied considerably less. It is of interest to note in this connection that the steam turbines in torpedo boats weigh about 45 lb. per B.h.p. and aeroplane motors but a little over 1 lb. per B.h.p.

20. The small oil motor has other advantages over the steam engine, and these can be briefly enumerated as follows: Starting takes only a few seconds; fuel is consumed only during operation; combustion in the cylinders can take place uninterruptedly for a long period of time; the engines require little attention and the oil tanks can be replenished more easily than coal bunkers can be filled, and without the dirt accompanying the latter procedure.

21. Disadvantages.—It must not be thought that oil motors have no disadvantages, for there are some, chief among which may be mentioned the following: Fuel oil is more expensive than coal and is not available in all ports; furthermore, lubricating-oil consumption is greater than in the case of steam engines as one must deal with higher temperatures and, as a rule, higher pressures. The operation is also more regular than that of a steam engine, as oil motors cannot be run as slowly as is desirable when reversing from ahead to astern. The causes of interruptions (especially with electrical ignition) are often difficult to locate; the motor frequently works noisily with smoking and malodorous exhaust; the dangers due to fire and explosion are greater, and the life of the machine is less.

High-Power Motors

22. Advantages. — The statements made in regard to the low-power motor are also true to a certain extent in the case of the high-power motor, but in addition the following items should be noted: With larger output the economy of a power plant becomes of greater importance. The low efficiency of most steam plants is due to the fact that the heat generated must travel through heavy boiler plates, and that there is a great loss of heat through the exhaust, and through condensation of steam. Furthermore, the steam plant operates with a small temperature difference, and to increase this difference is exceedingly difficult because it is very desirable to work with higher temperature limits. With saturated steam the pressure soon increases beyond a practical value and with superheated steam the walls of the superheater soon reach their limit, as they should never be allowed to become red hot. On the other hand, in the oil motor the heat formation and utilization take place in the working cylinders, and the higher temperature limit is therefore the same as the temperature of combustion. The value of the lower temperature limit is greater than in a case of a steam plant, but the temperature difference of the process is higher.

23. Another advantage of the oil motor is due to the ease with which the air supply necessary for complete combustion is regulated and since the point of ignition is practically constant, there results complete combustion. On account of the great heat which exists in a boiler room it is very difficult for the stokers to maintain normal pressure in a steam boiler; the coal consumption is accordingly increased by reason of careless firing but the speed of the vessel decreases. On the other hand, in the case of the motorship the reverse holds true. If the fuel oil becomes warmer it is more easily vaporized, with the result that fuel consumption decreases, while the speed of the vessel increases.

24. Since fuel oil can be stored in tanks a considerable saving can be made in space, more oil can be carried and a greater cruising radius thus afforded. The weight of a slow-running four-cycle-stroke oil motor for cargo ships is about the same as that of a steam plant but far less space is required. The horsepower and speed are about the same for a twin-screw motorship as for a single-screw steamship, but as the former's screw diameters are smaller their efficiency is greater and the vessel can thus be more easily manoeuvred. The cylinders of a motorship are all similar, and since they work independent of each other, one or more of them can be put out of service and the motor still continue to operate.

25. Steam boilers and their fittings require as a rule a considerable outlay for repairs and maintenance; also the sides and bottom plates of the hull which are nearest to the coal bunkers are likely to corrode because of the sulphur content of the coal, and in addition sea-water in the ballast tanks may also cause corrosion of the plates. On the other hand, a motorship has no boilers and the fuel is stored in bottom tanks, and this very fact is a great advantage since the tanks are protected by the oil.

26. Disadvantages.—In the case of a single-cylinder oil motor, the torque, acting on a single shaft is limited, but everything else being equal, such as shape and line of hulls, propellers, r.p.m. and B.h.p., the i.h.p. of the motorship will be greater than that of the steamship. Since the reciprocating parts in a crude-oil motor weigh more than those of a steam engine, the balancing of the masses is more difficult and the shifting forces greater. At light loads the pistons in a large motor are not tight enough to maintain high compression, and since the combustion space is not sufficiently warm for positive self-ignition, large motors can only be run when under light loads at approximately one-third to one-fourth normal speed. Furthermore, the heat transmitted to the cooling water per unit area of the cylinder is about two and one-half times as great in the combustion chamber as in the cylinder walls, and accordingly the heat drop in the cylinder wall is very considerable and tends to introduce stresses in the material. If the limits of elasticity are exceeded these stresses will be transmitted to distant parts. The material is also subjected to high stresses as a result of rapidly repeated power impulses, high temperatures and great pressure in the cylinder.

27. Advantages. The constant pressure motor oil consumes less fuel than the constant-volume type, and this due to the fact that it has greater compression and a higher expansion ratio. Furthermore, the fuel oil is introduced into the combustion chamber in its natural condition, and is, therefore, more completely vaporized, with the result that combustion is more complete. A cheaper grade of oil, therefore, can be used. The mean effective pressure is also greater and therefore greater output can be obtained and preignition practically excluded.

28. Disadvantages. The constant pressure oil motor also has its disadvantages. In the first place this type of motor costs more to produce than the constant volume type, and in addition an air compressor is necessary. The motor itself operates at high pressures and temperatures and the air compressor necessitates tanks for storing the air for starting and running purposes.

Constant Pressure Motors

29. Low pressure type. The low pressure oil motor is perhaps the simplest prime mover of its kind, and is especially adapted for use in small boats where the operators are usually unskilled. The chief advantages of this type of motor are its low first cost and small operating expenses. Furthermore, the low temperature in the cylinder and the low explosive pressure, together with its simplicity of operation make it a motor of great durability. This type, however, has some disadvantages and chief among them are its small power output, large cylinder dimensions, excessive weight and the long time required for starting.

30. Medium, or so-called Hot Bulb Type. The so-called hot bulb motor operates at a medium pressure with or without water injection. While the tendency to-day is to avoid water injection, if the hot-bulb motor be nevertheless operated with water injection its fuel consumption will be comparatively low; the temperature of inlet air low; overheating of cylinder and piston rings will occur; the cylinder will remain clean for a longer period, and the piston rings will not gum or stick. The water tank, however, adds weight, and considerably reduces cargo space. Furthermore, despite careful attention, corrosion and rust will rapidly destroy the motor, especially if sea water is used. The most serious objection, however, lies in the

fact that the amount of water injected must be regulated according to load, and this necessitates constant attention.

31. On the other hand, if the medium pressure motor is operated without water injection, the cost of maintenance is low, the mechanism construction simple and little attention is necessary. Its chief operating difficulty lies in the inability to properly time the supply of fuel oil as its injection against the highly compressed air is exceedingly difficult in the short time allowed before ignition takes place.

32. High Pressure Type. The advantages of high pressure motors with self-ignition and injection of fuel oil during the high compression cycle are practically the same as those of the medium pressure motor without water injection. High pressure motors, however, are usually operated with an oil chamber and such a type is very economical, has a high mean effective pressure, its cylinders are small, its weight low, and it can be started without any preliminary operations. Furthermore, since the oil fuel is not injected against a high pressure the oil pumps can be of simple design and are consequently easily maintained. Like all other motors, however, this type has its disadvantages—chiefly the fault of design and construction rather than operation. If the size of the oil chambers or atomizer holes be improperly proportioned fuel oil consumption will greatly increase. Since this type of motor cannot be started by hand, pressure air is necessary, and, therefore, the motor must be manufactured with great care. This, of course, means a higher initial cost. In operation, the ignition and combustion cannot always be controlled, and, if inefficiently operated, preignition will occur.

Four-Stroke-Cycle Motors

33. Advantages. This type of motor is particularly well adapted to high speed work, since it has a separate suction and exhaust stroke, and thus the cylinder is filled each time with a full and new charge. Compared to a corresponding two-stroke motor it uses less fuel per b.h.p. Furthermore, as it does not employ a scavenging pump,receivers, etc., the motor construction is simplified and better adapted for continuous hard work than the two-stroke-cycle motor.

34. Disadvantages. The chief objections to this type of motor are its increased weight and the greater space required. On account of the larger number of valves the valve gear is more complicated and noisy. Except with very large outputs the piston can act as a crosshead, and unless the cylinder diameter be greater than 20 in., water cooling is unnecessary. The crank motion of this type of motor necessitates a heavy crankshaft and heavy flywheel if smooth running is to be obtained. Furthermore, the exhaust valves are subjected to high temperatures and occasionally give rise to considerable trouble. This type of motor is exclusively used by the Danish and Dutch, and now the American merchant marine, and also finds a large field in the automobile and aeroplane industries, as gasoline motors work, as a rule, on the four stroke cycle.

Two-Stroke-Cycle Motors

35. Advantages. Compared with a four-stroke motor the two-stroke-cycle type has a greater output per cylinder, and everything else being equal, this excess will usually be about 75 per cent. On account of its greater pressure at the beginning of the compression stroke, the weight of the charge can be increased if the stroke volumes are equal. On the other hand, power is exerted only during three-quarters of the stroke, as during the remaining portion exhaust takes place. Thus the total stroke volume is not completely filled at the beginning of compression with a fresh charge, and the result is that for the same cylinder dimensions the output is only 75 per cent. greater than for a four-stroke-cycle motor. This difference, however, becomes even less for high-speed, two-stroke motors since the mean effective pressure is lower. By forced scavenging through the valves the fresh-air charge can, however, be made cleaner. In large units only the starting and fuel valves are subjected to high temperatures. In theopen type four-stroke motor, vapor from lubricating oil and exhaust gases escape into the engine room, thereby causing impure air conditions. This, however, does not occur in a two-stroke motor which has a closed crankcase. Finally, the two-stroke engine is very smooth running because of its more uniform torque.

36. Disadvantages. The chief disadvantage of the two-stroke motor is its high operating cost. This is due to its higher loss of fresh air charge through exhaust ports, smaller utilization of the working fluid, and higher heat loss due to cooling, friction and increased pump work. The mean effective pressure is lower because during the working stroke exhaust also takes place. The mean temperature during the cycle is higher than in the four-stroke motor and consequently cooling of the piston is necessary. Furthermore, the piston can act as a crosshead only in small motors; lubricating oil consumption is greater, and the exhaust ports become overheated if not water cooled. Finally, the stresses exerted on the moving parts are very large and, therefore, there must be ample sliding and bearing surfaces. The two-stroke type of motor is chiefly used in vessels where weight, space and first cost are deciding factors. Its reliability and economy, however, have not been so marked as in the case of the four-stroke motor, although in the Scandinavian countries, Germany and Italy it has been used to a considerable extent.

Double-acting Motors

37. Stationary double-acting motors have been used with fairly good results, but double-acting marine motors are as yet in an early stage of development. The chief advantages of the double-acting motor are its light construction, better balancing, its economical operation and the comparatively small space which it occupies. However, the first cost is higher, and the lubricating oil consumption is greater than in the case of a single-acting motor. This type is also more complicated and requires cooling of pistons and piston rods as the latter usually pass through the hot combustion chamber.

Horizontal Motors

38. The horizontal motor is chiefly used for stationary plants because this type is more accessible, can be greatly overloaded, is cheap to construct and can be placed in a space with low headroom. Like all other types of internal combustion engines, the horizontal motor has many disadvantages, chief among which are the following: The piston rings have a tendency to stick due to lubricating oil collecting on the lower half of the cylinder; imperfect lubrication thus results and this causes leakage and increases fuel consumption. The motor also has a tendency to rock and this necessitates a large foundation. Furthermore, the location of the crankshaft makes it exceedingly difficult to secure a direct drive of electric generators. These disadvantages in stationary plants usually outweigh all other considerations, and as a result the horizontal, double-acting, constant-pressure motor in large units is the type usually installed. On the other hand, in spite of the higher initial cost, the vertical motor is always used on ships as its operation, durability and great overload capacity make it an ideal installation.

Motor Details

39. Mechanism vs. Direct-Acting Trunk. Trunk mechanism is applied in small sized motors and the crosshead guide is used only in large motors. This is due to the fact that motors with trunk pistons are cheaper to produce; the overall height is reduced and it meets the requirements for a non-leakable piston. The trunk mechanism, however, has certain advantages and these may be enumerated as follows: Side pressure is taken up by the hot part of the cylinder and since one side of the piston may become hotter than the other, the piston will naturally bend toward that side. The cylinder will, therefore, have a tendency to wear oval in shape, causing the piston to blow. Furthermore, the piston will, notwithstanding guards, draw lubricating oil up into the combustion chamber, and this, of course, increases operating expense. On the other hand, when the crosshead is used the lubricating oil can circulate in great quantities and inspection is also simplfied.

40. Forced Feed vs. Gravity System Lubrication. The maximum pressures exerted between the wearing surfaces in an oil motor are greater than those in a steam engine, and consequently lubricating systems must be different for each type. In large oil motors high pressures are used to force the oil to all vital parts, and the wearing surfaces are thus separated by a film of oil. The loss due to friction is, therefore, re-

duced and the method also assists in keeping the surfaces cool and at the same time increasing their life. Forced feed lubrication also requires less attention and is independent of the engineer's skill as long as the run is not hindered. The oil consumption is economical as the oil can be filtered and used again. There is no splashing of oil in or about the engine room, and for this reason the system is well adapted to the high speed motors. The forced feed lubricating system with its double oil pumps, etc., is, however, quite expensive, and since the mechanism is not visible, a breakdown is not easily detected; consequently if one occurs a serious delay will be occasioned. The forced feed lubrication system with a closed crank case is used to great extent in high powered motors, whereas the centrifugal or gravity system is used in small motors.

41. Piston Cooling. Piston cooling may be accomplished by the use of either oil or water. If oil is used it may be combined with the forced feed lubrication system, and in such case should the cooling oil leak into the bottom of the crank case no harm will be done. On the other hand, if water is used and it gets into the crank case the oil will be expelled from the sliding surface and serious damage may result. If sea water is used as a cooling medium storage tanks are unnecessary, but if oil or fresh water is used, tanks and coolers must be provided, and for large motors these require considerable space. As a result large units use sea water for cooling purposes and medium size motors employ oil.

42. Scavenging Pumps. Piston type. The simplest and cheapest type of scavenging pump is a piston working in a closed crank pit. As a rule, however, this type of pump supplies insufficient air since the quantity of air is limited to the stroke volume. The cylinder is also insufficiently cooled and the volumetric efficiency decreases.

43. Stepped-Piston Type. Scavenging air obtained from a pump with a stepped piston is usually sufficient to meet all purposes, but if the piston is not tight, exhaust gases may mix with the fresh air, in which case there is great danger from explosion of the lubricating-oil vapors in the receiver. The stepped piston increases neither the length nor width of the motor, and if breakage occurs on a scavenging pump, only that individual cylinder is affected. The moving parts of such a pump are heavy and consequently large masses have to be accelerated and retarded. The motor, however, is increased in height, even where the wristpin is secured to the working cylinder, because the ratio of L (length of connecting rod) to R (crank radius) must be greater than normal in order to insure clearance between piston and shaft or bearing cap. This ratio, however, becomes less if the wristpin is secured in the pump piston, but the overall height of the motor will be greater. On the other hand, if the piston pump takes the place of a crosshead, the length of the wristpin can be increased and the bearing pressure thus reduced.

44. Special Pumps. The first cost of special scavenging pumps is high; furthermore, they require more room and, should they fail to function, the several working cylinders will be greatly affected. The chief advantage of special pumps is their lower oil consumption and the ease with which sufficient cold air can be obtained.

45. Each of the types of pumps mentioned has its various uses. The piston type is usually found on small motors, the stepped-piston type on submarine engines and motors of medium size, and separate or special pumps on heavy-duty motors installed on cargo and passenger ships.

46. Ignition Devices of Constant-Volume Engines. Although it has been stated that the constant-volume crude-oil motor is an unsatisfactory type, its ignition devices are of interest. If the "electric type of ignition" is employed the motor can be started immediately. The time of ignition can be controlled and varied at will. Electric ignition, however, it expensive and it is difficult for unskilled mechanics to keep it in order.

47. Another type of ignition device is the so-called "ignition tube." With this tube a greater compression ratio can be used and fuel consumption is also decreased. With this device the time of ignition can also be controlled and varied at will, but a steady or continuously burning torch is necessary and this is a great objection, especially at sea.

48. A third type of ignition system is the well-known "head" or "hot-bulb," which is simple in construction, action and operation. At normal speeds this type of ignition is the most satisfactory and, furthermore, it is not affected by damp air or water spray. The chief objections, however, lie in the fact that it requires a long time to start the motor; the heads are easily cracked; the compression ratio is small, and the mean effective pressure is low. Furthermore, if the load changes during operation the hot bulbs will often run cold in the four-stroke cycle and hot in the two-stroke cycle. Broadly speaking, however, this type of ignition has been found to be most satisfactory and is very largely used for all types of small motors using either kerosene or heavy oil as fuel.

INSTRUCTIONS TO ENGLISH INSPECTORS OF MARINE BOILERS

The repairing of the boilers of passenger steamers by the above process has been tentatively in operation for a considerable period, and, in view of the experience gained, the surveyors are informed that, provided the work is carried out to their satisfaction by experienced workmen, this process may be employed, within limits, for repairing cracks in furnaces, combustion chambers, and end plates of boilers, and in the same parts for reinforcing the landing edges of leaky riveted seams which have become reduced by repeated chipping and caulking.

In some old furnaces which have been repaired by the above process, it has been found that, after a few months working, cracks have again developed at parts adjacent to those welded; probably owing to the original material of the furnace having become fatigued and worn out by long and severe usage. In dealing with old furnaces, therefore, this fact should be taken into consideration.

It has also been brought to the notice of the Board of Trade that a shell plate of a cylindrical marine boiler cracked recently through a solid part where some surface welding had been done by the electrical process two years ago. The welding had extended for a length of about 12 inches along the outside caulking edge of one of the middle circumferential seams at the bottom of the boiler, the leaky edge of the seam and the adjoining shell plate having been covered (soldered) by metal deposited by this process in the usual way. The shell plate was 1 5-32 inch thick, and the crack, which followed the line of the surface welding, extended in a circumferential direction for a distance of 2 feet 9 inches.

For the present, it is not proposed to prohibit, within limits, the reinforcing of the circumferential seams of boiler shells if the end plates are well stayed.

In any case in which the proposed repairs to the boilers of passenger vessels by either of the above processes are of an uncommon or unusually extensive character, the particulars should be submitted for the Board's consideration and approval.

After repairs by welding have been completed, the parts at, or adjacent to, the welds should in all cases be well hammer-tested, and, unless the welding is of a trifling character, a hydraulic test of not less than one-and-a-half times the working pressure should be applied to the boiler after the hammer-testing has been effected.

RAISING SUNKEN VESSELS

For attaching wire hawsers to the hulls of sunken vessels where a diver cannot pass them under a new method called the limpet system is described. The limpet is a soft iron body, carrying a number of drill taps driven by small motors, the current being supplied from the salvage vessel. The limpet is lowered until it comes in contact with the hull of the vessel when it is magnetized, causing it to cling to the plates. The drills are then started, and after running a predetermined length of time the current is switched off, the limpet is hauled to the surface and the drills are left tightly fastened in the ship's hull. The ends of these drills are formed into eyes, to which the hawsers can be attached.

The Bolinder Crude Oil Marine Engine

This Well-Known Crude Oil Engine, Designed by Burmuster & Wain, of Sweden, Has Achieved a Great Reputation—It is Fully Described in This Article—Some Notable Installations

THE Bolinder Engine is the pioneer surface ignition crude oil engine. This engine is manufactured by the Bolinder Company of Stockholm, Sweden. The Bolinder factories were founded some 75 years ago by the Bolinder family, and the company has, since its start until the present time, been controlled and managed by members of the same family, Mr. Erik Aug. Bolinder being the present head of the concern. The works are to-day employing some 3,000 men, and the products are sold all over the world. The chief reasons for the remarkable success of the Bolinder products are the high quality of material used—the famous Swedish steel and iron —accuracy of workmanship, and clever designs.

Early Engines

About thirty years ago the Bolinder Company started manufacturing crude oil engines. In the early stages these engines were used only for smaller craft, but, by degrees, larger units were built and larger vessels equipped. Through practical experience and scientific work improvements were effected from year to year and the engine put on the market to-day represents the latest development in two-cycle crude oil engines. It has proven itself absolutely dependable under the most different conditions in craft of every description. It has also proven itself to be the most economic propulsive power for vessels of all sizes up to 4,500 or 5,000 tons d.w.

Used in All Types

This engine, of which about 650,000 B.h.p. are in use in all parts of the world, has been adopted in high-speed pleasure launches, passenger ships, tug boats, big cargo ships, lighters and barges, etc. Due to the simple construction and the small space they occupy, these engines are particularly adaptable as auxiliary engines in large sailing ships and are widely used in this service now, in American and Canadian, as well as in European vessels.

The "City of Portland," owned by Chas. R. McCormick & Co., of San Francisco, is a typical vessel of this class. She is 276 ft. by 48 ft. 3 in. by 19 ft. 1 in., 3,500 tons d.w., and equipped with 640 B.h.p. Bolinder engines. She and her sister ship, the "City of Helens," also Bolinder equipped, have made some record trips, as for instance a round trip of 17,600 miles in 106 days, actual running time.

Among recent notable installations, may be mentioned motor-monitors "M-19," "M-20," "M-23," M-25," and "M-28" of the British navy, each one equipped with 640 B.h.p. Bolinders.

In 1913 there was constructed in Glasgow the motor coaster "Isleford," of 480 tons d.w. This vessel was equipped with a 320 B.h.p. Bolinder engine, and was at that time the highest powered vessel of its type ever built. The vessel attracted a good deal of attention, both among shipbuilders and in the press. The "Isleford" was purchased by the Royal Navy Ordnance Department of the British Admiralty. Since then the British Admiralty has been using the Bolinder engines very extensively, and the building of the motor-monitors referred to above was, no doubt, a direct result of a satisfactory experience with the "Isleford."

Rapid Progress

It is remarkable how fast things have moved during the last few years. In 1913 a 480-ton vessel, with 320 B.h.p. engine, was considered an achievement. Three or four years later the Bolinder engine was used for vessels up to 4,500 tons d.w.

Among larger American installations could be mentioned four 4,500-ton d.w. tankers, each fitted with twin 500 B.h.p. four-cylinder engines. A second class of full-powered Bolinder-engined vessels is formed by the two 3,200-ton d.w. steel freighters built at Manitowoc, Wisconsin, in 1916, originally for Norwegian ownership, but now in the service of the U. S. Shipping Board.

There can also be recorded a number of Standard Oil tank barges, each fitted with 320 B.h.p. Bolinders. The records available at the Marine Department of the Standard Oil Company of New York show some interesting figures on the subject of economy in fuel consumption. While the Bolinder people guarantee these engines not to consume more than 0·58 lbs. of fuel oil per B.h.p. per hour, yet after three years' continuous service these engines, according to the log books, average a fuel consumption of as low as 0.45 pounds.

The models "M-I" and "M-II," which are the types recommended for larger installations, are built in the two-cylinder size supplying 90, 120 and 160 B.h.p., and in the four-cylinder sizes supplying 240, 320 and 500 B.h.p. All engines are of the same general design, simply differing in cylinder area or number of cylinders.

Description of Engine

The models M-I and M-II Bolinder engines have a number of features which place them on an entirely different standing compared with other two-cycle crude oil engines of the surface ignition type.

In these engines improvements have been made so that the combustion is as complete as it is possible to obtain in an internal combustion engine. This is done by means of mixing the fuel with compressed air before injecting it in the cylinder, and for this purpose a special nozzle has been designed in which fuel oil is automatically mixed with air.



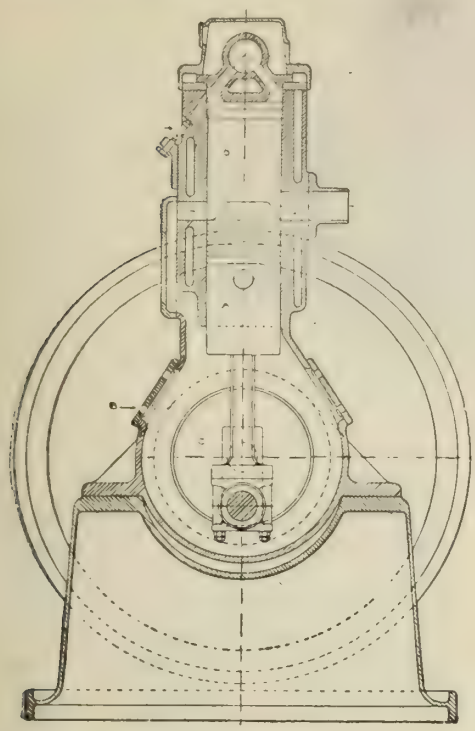
"CITY OF PORTLAND."



"LAKE ONEIDA."

No valves governed by cams, levers or camshafts are used. For supplying the air to mix with the fuel a two-stage air compressor is fitted to the engine

on the fore end of the bedplate and driven by a separate crank on the engine shaft. The air is compressed to about 425 pounds per square inch, and after having been cooled is conducted to



SECTION THROUGH ENGINE.

the injection nozzles through a compensating vessel. This latter is also connected with the starting vessel, so that when opening the stop valve on this the vessel is charged with air from the compressor to a pressure of 170 pounds per square inch. The compressor, the compensating vessel, and the starting vessel are all supplied with safety valves.

As said before, the combustion is very complete in this engine. The exhaust gases are, at full load, sightless and nearly without smell. After one month's run no soot or carbon is to be found in the cylinders or on the pistons.

No water injection in the cylinders is needed even at over-load. The engine can use heavy and cheap oils.

The consumption of lubrication oil for the cylinders can be very much decreased and yet the cylinders are very durable, due to the complete absence of soot and carbon, which wears the cylinder walls. Although the combustion is complete the compression and explosion pressure are low.

As the temperature of the ignition chamber is very low, it prevents troubles due to high heat, as for instance, cracking the chamber.

The Working Cycle

The motors are of the two-cycle surface ignition type and the working cycle is briefly as follows:

When the piston "A" at the end of its downward stroke is moving up towards the ignition chamber "E," the necessary air for scavenging and combustion is drawn through the air valves "B" into the enclosed crank case, and at the same time the air in the cylinder "D" is being compressed.

When the piston "A" has reached its extreme upward position, a certain amount of oil is injected into the ignition chamber "E" through the nozzle "F," and the fuel charge ignites, resulting in the expansion of the gases driving the piston downward toward the shaft.

During this downward stroke of the piston, the air in the crank case is compressed. As the piston nears the end of its stroke the exhaust port "G" opens, and immediately afterwards the inlet air port "H."

The burnt gases escape through the exhaust port "G," while the compressed air in the crank case entering the cylinder by the port "H" completes the scavenging work and furnishes the cylinder with air necessary to make up the next charge in the cylinder.

All model M-I and M-II engines are direct reversible.

The Reversing Apparatus

The reversing of the engine's direction of rotation is effected by means of pre-ignition without appealing to any external source of power such as compressed air, or other complicated devices.

The reversing is accomplished in 4 to 5 seconds, and may be performed repeatedly without a hitch, which is not possible when using compressed air.

The construction of the reversing apparatus is briefly as follows:

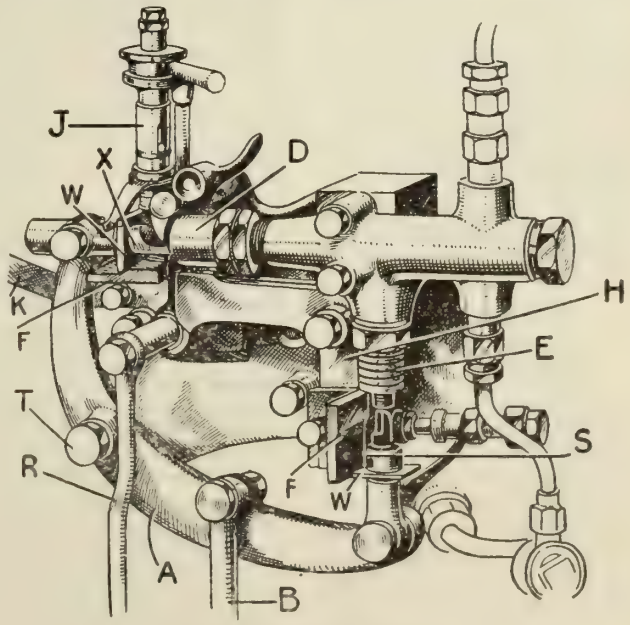
"A" is an oil fuel pump having two plungers "B" and "C." The plunger "B" is adapted to work during normal conditions when the engine is running in one direction or another, while the other "C" is used for reversing. An eccentric on the main shaft imparts a rocking motion to the lever "E," which latter is moving round the bolt "M." To this lever two strikers "F" and "T" are attached, which, operating the two plungers "B" and "C" slide on two faces on the angle-piece "H." This angle-piece has a motion round the bolt "N," the extent of which is determined by the abutments "O" and "R."

At "L" and "P" there is one spring to control the speed and the amount of fuel supplied to the cylinder. The link "K" surrounding the disc "D" is connected by a rod with the angle-piece "H," which latter can be lifted from the abutment "O," and at the same time moved towards the abutment "R," thus engaging the inside vertical edge of the link "K." The striker "T" is thereby means of the reversing lever "G."

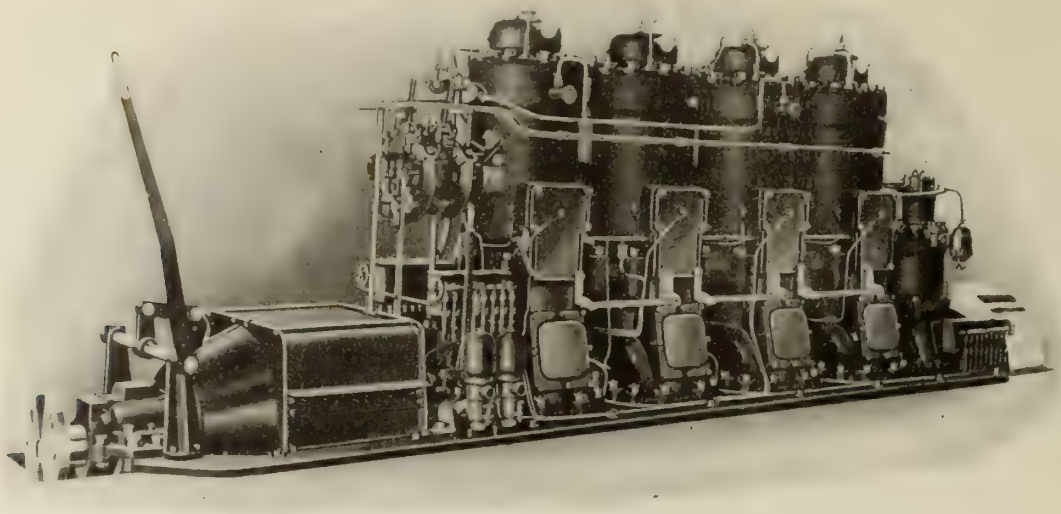
Suppose the engine is running ahead in the direction of the arrow, the angle-piece "H" is then pressed against the abutment "O" on account of its own weight and also by the weight of the link "K." The striker "T" is thereby raised so that it cannot strike the plunger "C," while on the other hand the striker "F," working during normal running for ahead or astern, takes up such a position as to be able to strike the pump plunger "B." The reversal of the direction of movement of the engine takes place in the following manner:

The reversing lever "G" is pulled aft so that the edge of the link "K" is brought into engagement with the friction disc "D," which is thereby lifted.

The horizontal part of the angle-piece "H" is thus lifted from the abutment "O," thereby raising the striker "F" so that it cannot strike the plunger "B." The engine will in such a manner, owing to this and to the spring "P," slow down automatically to a speed suitable for reversing. While the horizontal part of the angle-piece "H" was lifted as above, the vertical part of the same angle-piece "H" is moved from the position illustrated towards the abutment "R," giving the striker "T" the position in which it will press the plunger "C" inwardly and consequently feeding one charge of fuel into the cylinder. This



THE REVERSING GEAR.



THE BOLINDER ENGINE.

will explode before the working piston has reached its upper position. The piston is thus stopped, driven backwards, and the engine begins to move in the opposite direction.

Immediately the engine has begun to rotate in the opposite direction the link "K" is moved downwards due to the friction created by the disc "D." On account of this the horizontal part of the angle-piece "H" is automatically shifted towards the abutment "O" so that the striker "F" is again made operative and the striker "T" is thrown out of action.

If the engine is to be reversed from astern to ahead, the lever "G" should be pulled aft and the reversal will take place as described above.

The simplicity and the few working parts enable the Bolinder engine to be operated without keeping an expensive stock of repair parts on board. There are no cams, valves, gearing, electric ignition or vaporizer to get out of order.

The Bolinder is made to a standard gauge, therefore all parts are interchangeable, and replacements can be ordered with absolute certainty of their fitting accurately.

The Bolinder engine is marketed in Canada by the Swedish Steel and Importing Co., Ltd., Montreal.

BOARD OF TRADE ANNOUNCEMENT

The Board of Trade have received, through the Norwegian Consul-General, a silver cup, which has been awarded by the King of Norway to Mr. W. McKibbin, master of the ketch "Howard," of Kirkwall, in recognition of his services to the crew of the Norwegian SS. "Sarpfos," of Christiania, in February last. Money awards have also been made to Mr. W. J. McKee, mate, and J. McKibbin and R. McKibbin, seamen of the "Howard."

His Majesty the King has been pleased on the recommendation of the president of the Board of Trade, to award the silver medal for Gallantry in Saving Life at Sea, to Lieutenant Ross P. Whitemarsh, United States Navy.

On the 18th June, 1918, the SS. "Dwinsk," of London, was torpedoed and sunk in the North Atlantic Ocean. At the time of her loss the vessel was returning to the United States after having conveyed a number of American troops to France.

After she was struck all on board took to the ship's lifeboats. Lieutenant Whitemarsh, who was on board the "Dwinsk" as convoy officer, went into No. 6 lifeboat with another American and nineteen British subjects. After sailing for four days this boat encountered a cyclone. Lieutenant Whitemarsh at once volunteered to take the tiller, and remained on watch without a break until 5 a.m. next morning, when the storm had almost subsided. During the storm the boat's crew was in the gravest peril; one man was washed overboard and drowned, and Lieutenant Whitemarsh ordered the other occupants to lie down at the bottom of the boat, while two of them took turns in holding on to his legs to prevent him from being carried away.

After ten days of terrible privation and exposure the survivors were picked up by the United States SS. "Rondo," which landed them at Norfolk, Va.

Lieutenant Whitemarsh set an example of cheerful courage to all his companions, and his bravery and devotion were undoubtedly the means of saving their lives.

SHIPMENT OF COAL FOR THE BALTIC AND NORWAY

The Controller of Coal Mines has issued instructions to the collieries that in supplying bunkers and coal cargoes for steamers loading for the Baltic and Norway, preference is to be given to vessels which have timber charters for the return voyage approved by the Timber Controller or persons duly authorized to act on his behalf, provided that the shipment complies in other respects with existing requirements.

In order to obtain the advantage of this arrangement shippers are to apply for certificates to the Timber Controller's Representative, Salisbury House, London, E.C., and these certificates are to be forwarded to the colliery from which the coal is to be supplied.

SHIP CONTRACTS TO BE GIVEN OUT

Statement From Ottawa About Building To Be Carried on This Season

According to information received from the representative of MARINE ENGINEERING at Ottawa, the Government will shortly give some more contracts for ships to the Collingwood Shipbuilding Company, and the Dominion Shipbuilding Company. They will also give some to another of the St. Lawrence yards.

The method employed by the R34 to determine her position is one that discounts atmospheric conditions, and does away with the need of a horizon, artificial or otherwise. A moving pointer attached to the wireless instrument points to the direction that the signals are coming from. If the signals are being received from three stations set at wide angles on the earth's surface, the navigator has only to perform a simple triangulation to determine his exact position.

In the Great War some of the losses in killed were as follows: Russia, 1,700,000; France, 1,385,000; British Empire, 692,000; Germany, 1,611,104; Austro-Hungary, 800,000; Turkey, 300,000; Italy, 460,000; Serbia, 320,000; United States, 67,813.

Description of Clyde-Built Motor Ship "Glenapp"

Fitted With Burmeister & Wain Diesel Engines, Manufactured by Harland & Wolff—Some Comparisons With Earlier Ship "Sealandia"

By courtesy of the "Engineer"

WE anticipated that when we visited the big motor ship Glenapp we should find it necessary to give many details of improvements which had been made since the days of the Sealandia, the engines of which are of the same type, but built by Messrs. Burmeister & Wain, of Copenhagen, whilst those of the Glenapp were built by Harland & Wolff, Ltd., under license from the Danish Co. But we found, in fact, nothing of the kind, and it is a remarkable testimony both to the genius of Messrs. Burmeister and Wain and the foresight of Messrs. Harland and Wolff that the alterations made in seven years, so far as general features of design are concerned, and omitting points of minor detail which are bound to be subject to modification in any type of engine, amount to not more than three, one of which is connected with the cooling of the piston, one with the fuel pumps and the third with the arrangement of the main air compressor. The latter, we surmise, is to be attributed rather to personal predilection than to a real need indicated by experience.

Dealing with these three alterations, we recall that in the Sealandia, the lubricating oil, after passing up the connecting rod, entered the piston through the hollow piston rod in order to cool the piston, and then flowed back through the rod to lubricate the gudgeon pin and guides. Experience has shown that the heat of the piston, in these engines at all events, is sufficient to carbonize quite an appreciable amount of the oil, thus not only causing waste, but forming a deposit on the internal piston surfaces, which interferes with cooling—a rather vital objection, though we believe that in many fast-running, two-cycle engines of fairly large power, oil cooling is still used with perfect satisfaction. However that may be, the oil circulation has been modified in the Glenapp, and water is used to cool the pistons.

The alteration in connection with the fuel pumps consists in the substitution of a battery of eight fuel pumps for the eight cylinders in each engine, for the single pump for each set of four cylinders in the Sealandia. We take it, though this is not based on information from the owners, that the increase in the size of the engine has justified the pump per cylinder, as the fuel delivery from each pump has become somewhat more tangible. At the same time the liability to breakdown is correspondingly reduced.

The third alteration is, as we have said, probably rather a personal matter than one of necessity. In the Sealandia the air compressor of the main engine had only a single-stage compressor which compressed air, delivered to it at 300 lb. per sq. in., from an auxiliary two-stage compressor which was continually running, up to 900 lb. for blast air injection. There are certainly arguments in favor of that course, but in the Glenapp there are two three-stage compressors on the forward end of the crank shaft of the main engine, though there is still an auxiliary compressor which is always kept running when the ship is in crowded waters or when there is any chance of having to manoeuvre the engines. This compressor supplies air for manoeuvring purposes alone. We are not prepared to argue the pros and cons of the two arrangements, but we simply record the alterations.

These, then, comprise all the changes which an experience of almost exactly seven years has suggested, and we would refer our readers to issues of March 8, 1912, page 247; March 15, 1912, page 269, and March 22, 1912, page 292, for a full description of the design and engines of the Sealandia, for it equally covers the main features of the Glenapp, where we have the same arrangement of reversing gear with the cam shaft driven from coupling rods at a reduced speed from the crank shaft, the shifting of the cam shaft by means of a cam path on a weight shaft which, through links, removes the rollers from the cams for the purpose, the automatic removal and replacement of the starting valve rollers from and on to the cams by the action of air, and the holding up of the exhaust valve for compression release while reversing, and so on, even to the Aspinall governor.

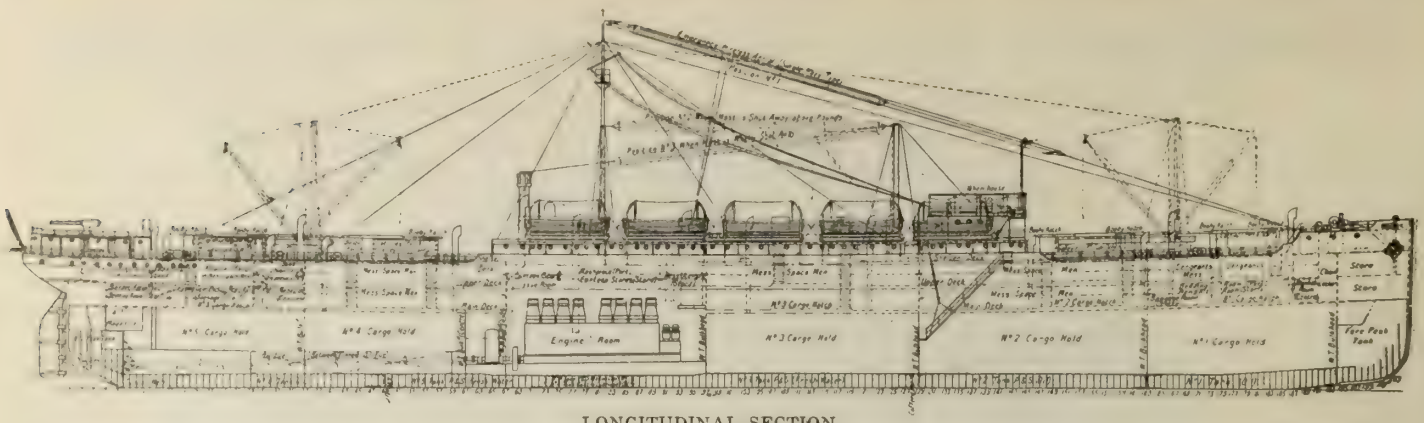
Among minor points may be mentioned a neat method of indicating the direction in which the engines are running. It consists of no more than a little screw thread cut on the pump shaft and covered by a brass plate with a glass opening. On the plate are two arrows pointing in opposite directions, one marked "ahead" and the other "astern." It is remarkable how clearly movement in either direction is conveyed to the mind by this simple expedient. Then, too, alterations, whether we should call them improvements or not we cannot say, have been made on the starting air admission valve arrangements. The main air admission valve of the system is opened and seated by compressed air, so that only a small by-pass valve has to be raised by the reversing lever to allow the comparatively large air admission valve to be opened instead of having to lift the valve direct by the reversing lever. When this valve is returned to its seat so as to shut off the air, it is jammed home by a hand wheel, though the hand wheel cannot raise it off its seat owing to the length of travel and the position of the collar on the rod which holds the valve down.

We may note also, that whilst in the Sealandia, the fuel valve and the inlet and exhaust valves were in the same line—the former being in the centre of the cylinders—in the Glenapp the fuel valve is moved appreciably to one side, the inlet and exhaust valves being moved a corresponding amount to the opposite side. This modification has the effect of largely increasing the space between the valve pockets so that each can be completely water-jacketed, and the alteration is no doubt of considerable advantage. We were rather surprised to hear, though, that the removal of the fuel nozzle from the centre of the dished piston has no appreciable effect on the fuel consumption, but we are informed that such is the case. Finally we may note that the lubricating pipes to the cylinders have been reduced to two per cylinder, one on each "thrust" side.

In the "Sealandia" article we raised doubts as to whether experience would show that the continued use of salt water for cylinder and cover cooling purposes would prove altogether satisfactory, but no need has apparently yet been found for fresh water, and the only results of using salt water seem to be that a certain amount of quite soft and fine scale is thrown down to the bottom of the passages, etc. This sludge can be very easily washed out, and no shipping, or even brushing, is required. This must indeed be a great relief, as the provision of evaporators, etc., could not be contemplated with complete equanimity.

The above can, we think, be taken, if read in conjunction with our articles on the Sealandia, as a description of the present day Burmeister & Wain engine as built by Harland & Wolff, Ltd.

We may recall that the Sealandia had two sets of eight-cylinder, single-acting four-cycle engines, with cylinders 520 mm. diameter by 730 mm. stroke, giving 1,250 brake horse power per set at 125 r.p.m. The Glenapp has also two sets of eight-cylinder, four-cycle engines, but with cylinders 750 mm. diameter by 1,100 mm. stroke, giving 3 200 indicated horse power per set at 120 r.p.m. and running down to about 42 r.p.m. for dead slow. With propellors of 14 feet, 6 inch diameter by 12 feet, 6 inch pitch, she has made a speed of over 14 knots. The crank shaft is 18¼ in. in diameter. The auxiliaries are all electrically driven. There are three sets of four-cylinder, 320 brake horse power Diesel engines, driving 150-kw. dynamos for supplying current for lighting, heating, etc., and



LONGITUDINAL SECTION.

for the Hele-Shaw-Martineau steering gear which is fitted, and which is apparently giving as great satisfaction as ever. Then there are electrically driven centrifugal pumps for the circulation of lubricating oil, those for the salt water for cooling the jacket and cover, those for the fresh water for the piston and for the fuel oil, all in duplicate. The fuel oil pumps are fitted with duplicate filters, so that one may be cleaned without stopping the engine. It is interesting to learn that the oil in the lubricating system is never completely renewed, but only added to from time to time, a course which is only rendered possible by the complete separation of the cylinders from the main lubricating system. The fuel used is at present Texas oil of ·890 specific gravity, 185 degrees flash point, and the consumption appears to be about 0.306 lb. per indicated horse power per hour. There is about 2 per cent. of sulphur in the oil, but it has not been found deleterious, as copper is carefully avoided in the fuel pipes.

The exhaust system is the same as on the Sealandia, except that escape into the atmosphere is made through two pipes bent slightly aft. We are glad to see that the use of the mizzen mast as a funnel has not been perpetuated.

Before leaving this interesting ship we must mention a point which we could not help noticing, and that is the superior class of men that is being drawn into the marine engineering service afloat, at all events in motor ships. There is no doubt, for one thing, that the conditions on a motor ship as compared with a steam ship are pleasanter, the heat is less, the fireman troubles do not exist, and higher wages can be afforded owing to reduced staff; but, beyond all this, the Glen Line people appreciate the services of their engineers and take an interest in them and their conditions, give them good quarters and good food, and undoubtedly score heavily in consequence. The impression given is that each man has the honor of his company at heart, and this feeling is bound to act for the good of all.

ITALIAN NAVAL MOTOR BOATS

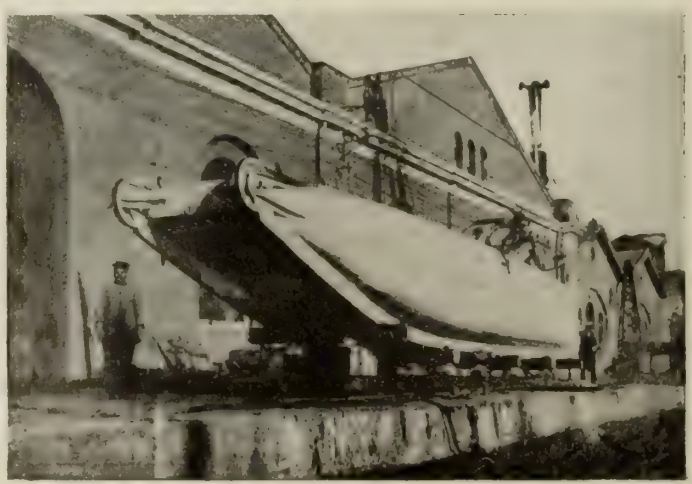
From Motor Ship and Motor Boat.

Early in the war the Italian Government had constructed in America about 20 or 30 naval motor boats, mostly with Sterling engines, having a speed of about 25 knots. Afterwards 250 motor craft of somewhat similar type were built in Italy with Italian motors, fitted with dropping gear for two 18 in. torpedoes. They must have been fairly large, for the speed was only 25 knots, although the vessels were fitted with two 375 b.h.p. petrol engines. They were first intended solely for operations against submarines, but were afterwards widely used for general patrol work.

One of the most interesting of the motor craft built in Italy during the war was the marine tank, of which some details have already been published. It was known that one of the harbors which the Italians wished to enter was blocked up by a series of booms. A boat was, therefore, built more or less like a punt, with a small petrol motor driving a propeller in a tunnel so that it was entirely protected. The power was sufficient to give the boat a speed of about five or six miles per hour and enable it to get up to the boom of defence. The propeller was then stopped, and electric motors put into operation, these being geared to two endless chains which went completely round the bottom and deck of the boat close to each side. The chains were fitted with steel teeth about 9 or 10 inches in length, and these clawed on to the boom and hauled the boat over. Once inside the boom the ordinary propeller was set to work again, and it is stated that this craft had one big success, and did its work satisfactorily, although it was unable to return.

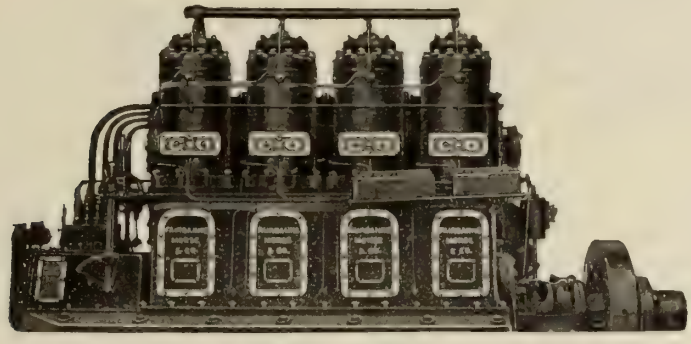
As an instance of the ability of ships built on the Isherwood system to resist severe strains, the case of the oil tanker "San Zeferino," is typical. This vessel sunk after being holed in the engine room, which was right aft. Her stern sank in 90 feet of water, till her sternpost rested on the bottom, but the buoyancy of her oil cargo, kept the fore part up so that her fore foot was out of water. She remained in this position for a month before being floated, when a good portion of her oil cargo was salved in perfect condition, and the hull was in an absolutely unstrained condition.

An account of a dry dock for which patents are pending comes from the United States which reads like a fairy story. It is said to be the product of ten years' engineering study. The new dock will, it is said, have a speed of 42 knots per hour, and will be able to go to sea and relieve vessels in distress as well as perform the usual functions of a dry dock. It will be fitted with cranes and winches which will enable it to grapple with and raise any vessel existing. No details are given as yet, but they will be looked for eagerly.



BOOM CLIMBING MOTOR BOAT.

The Fairbanks-Morse Type "C-O" Marine Oil Engine



"C-O" DIRECT REVERSING ENGINE.

THE possibilities of oil as a money saving fuel have been brought before the work-boat owner more strongly than ever by the "C-O" Oil Engine, which has been perfected by Fairbanks, Morse & Co., and has been on the market for the last four or five years.

This engine operates with the greatest success on heavy fuel and crude oils, a variety of which can be found in practically every port. The unusual economy shown, with the low price at which suitable oils can be purchased, has made this engine extremely popular.

A brief non-technical discussion of the engine and the principle upon which it operates may be of interest.

The "C-O" marine oil engine is of the vertical multiple cylinder two stroke type, using crank case compression for scavenging. While it does not use as high compression as is found in the Diesel type, the compression pressure has been carried high enough to secure much better economy than is obtained in what is commonly known as the semi-Diesel type of engine.

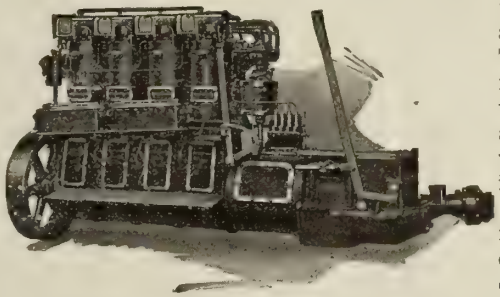
The fuel is injected by means of a pump through a nozzle in such a way that is is thoroughly "broken up" and burns readily when coming in contact with the heated surface of the combustion chamber and mixed with the air which has been heated by compression.

A sensitive governor controls the length of the pump stroke, thus varying the quantity of oil injected according to the load on the engine, maintaining a constant speed. In connection with the governor is a positive speed control arrangement which makes it possible for the operator to vary the speed of the engine at will, anywhere from normal speed down to 35 per cent. of normal speed. This makes the engine practically as flexible for negotiating tortuous streams, harbor navigation or making landings, as a steam engine.

Our attention has been called to the fact that all troubles resulting from overheated cylinder heads or "hot balls" have been avoided as the cylinder and the combustion chamber are water cooled, thus no part of the engine is permitted to become heated to the extent that it might cause rapid deterioration or breakage. Another very important feature is the fact that the combustion chamber is separate from the cylinder in which the piston travels. As no unburned fuel enters the cylinder lubrication is made more perfect than where the fuel is burned in the cylinder.

The engine is designed to deliver its full rated power without the aid of water spray with the fuel. While the use of water in connection with the fuel is a decided advantage to the designer, due to chemical action, it causes rapid wear on the cylinder and piston.

One of the troubles encountered by Fairbanks, Morse & Co. in bringing out this engine was that they could not find



"C-O" ENGINE WITH REVERSE GEAR

a reverse gear on the market which was entirely satisfactory, due to the power developed by the engines at moderate speeds. It was, therefore, necessary for them to design their own gears, and they are being built in the factory with the engines, along such liberal lines that they will withstand any strains which may be thrown upon them in the natural operation of the vessel, thus making the reverse gear and the clutch as long-lived as the engine itself.

Sizes larger than 100 h.p. are of the direct reversible type and do not require reversing gears. Where these larger sizes are installed as auxiliary power in schooners, "sailing clutches" made by F. M. & Co. can be furnished.

To start the engine an ignition tube is heated, after which compressed air is admitted to each cylinder in turn. The air admission valves are automatic, making the starting of the engine a very simple operation. The highest air pressure required in starting these engines is 175 pounds.

An idea of the saving possible with this type of engine may be gained by noting the results obtained in one instance which has been brought to our attention.

The "Lubec," a 62½ ft. passenger boat, which makes hourly trips between Eastport and Lubec, Me., was originally powered with a steam engine. The fuel cost with the steam plant in this service was $140 for seven days. This engine was replaced with a 100 h.p. "C-O," which drives the boat 10½ knots an hour in the same service as formerly, at a weekly fuel cost of $32—a saving of $108 per week. In addition to the fuel saving, there is less help required with the oil engine, greater cargo capacity, and other obvious advantages.

We understand that equally good results are being obtained wherever these engines have been installed.

A MANUAL OF MARINE ENGINEERING

The revised edition of the above volume by A. E. Seaton contains most of the matter included in previous volumes, and in addition chapters on the heavy oil engine, geared turbines, and superheaters have been included.

The whole theory of marine engine design is covered in this volume, which is divided into thirty-one chapters, and eighteen appendices. The rules of all the classification societies are included, as well as the Board of Trade rules. The recommendations of the British Marine Engineering Design and Construction Committee are given. 116 tables and 339 illustrations are used in the volume, which will give some idea of its comprehensiveness.

Starting with a chapter on fundamental principles and various methods of propulsion, the author goes on to the question of resistance of ships and determination of horse power. After considering the theory of steam used expansively, the various types of marine engines are dealt with.

Many chapters are devoted to the design and construction of the various parts, from cylinders to tail-end shafts. The propeller has a chapter devoted to it, and the theory of both paddle and screw propellers is treated at length.

A chapter is devoted to oils and lubricants, and a useful table of frictional co-efficients is included in this.

The objects and methods of making tests is gone into, and the various Admiralty tests given.

A specially interesting chapter is that dealing with the weight of machinery in various classes of vessels, its proportion to displacement, and relation of cost to weight.

The whole volume is, as its title implies, a thorough development of all the considerations involved in the design and construction of every type of marine prime mover.

A New Prime Mover; the Still Engine

The Following Article Abstracted by "The Engineer" From a Paper by Frank D. Acland Read Before the Royal Society of Arts Gives Some Interesting Information Relative to a New Development in Prime Movers. The Combination Here Described Gives Promise of Remarkably High Efficiencies

THERE are two methods of producing power by the combustion of fuel—either under boilers or within the main cylinders of combustion engines. The greater part of the world's power is still derived from steam, which, owing to its proved reliability and greater adaptability to the services demanded of it, holds the field in competition with its rival, the internal combustion engine, but the latter shows a far higher heat efficiency. Yet it cannot start itself; cannot develop its full power, except at full speed; is a poor performer at low speeds; can only operate on moderate overloads for short periods; and may cease to operate, owing to a small defect, without warning. So combustion engines have as yet made little progress in competition with steam in locomotive work, and have supplanted steam, but to a limited extent, in marine and stationary engines.

The maximum ideal efficiency of a heat engine is obtained where the difference existing between the highest and lowest temperatures of the working fluid is greatest in proportion to the maximum temperature, and here the internal combustion engine, with an initial temperature higher than the furnace temperature of the boiler, and even higher than the melting-point of cast iron, is capable of realizing better thermal conditions than any other form of heat engine; but in its turn it suffers from two disadvantages—it ejects its working fluid at a temperature too high for ideal conditions, and it loses heat energy to a regrettable extent in the cooling of its cylinder.

The possibility of combining in one engine the superior thermal cycle at the high temperatures and pressures of the combustion engine with the low thermal cycle of steam to deal with its rejected heat, and, in the same engine, to add the superior working advantages of the steam engine is the basis of work carried out by Mr. W. J. Still.

The Still engine is an engine capable of using in its main working cylinder any form of liquid or gaseous fuel hitherto employed; it makes use of the recoverable heat which passes through the surfaces of the combustion cylinder, as well as into the exhaust gases, for the evaporation of steam, which steam is expanded in the combustion cylinder itself on one side of the main piston, the combustion stroke acting on the other side. It increases the power of the engine, and reduces the consumption of the fuel per horse-power developed.

Its primary object is not to use the waste heat for raising steam, but first to use it in improving the thermal conditions of the working cylinder, and so ensure the maximum efficiency from the fuel burnt within it, diminishing, as a consequence, the heat lost in that operation. Since the maximum efficiency is obtained by combustion of the fuel in the cylinder, and the minimum by the evaporation of the water in the steam generator, it is evident that the larger the quantity of steam which can be generated per horse-power developed by the combustion cycle, the lower must be the heat efficiency of the whole machine.

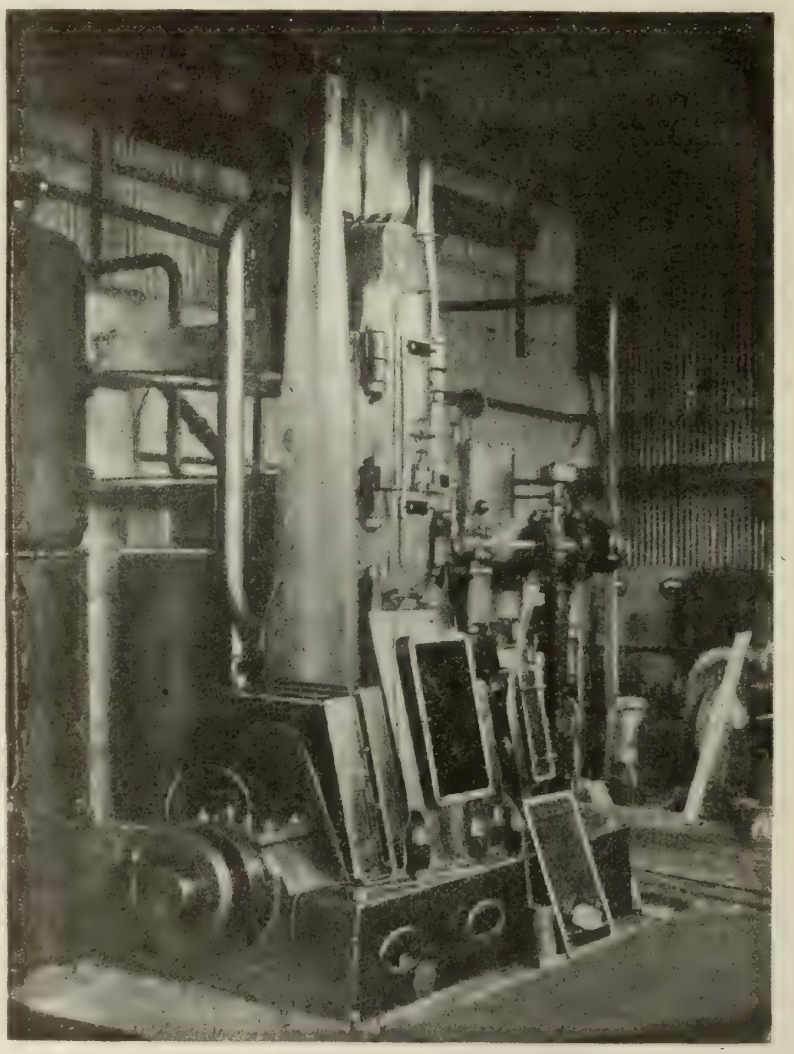


FIG. 1—VIEW SHOWING STILL ENGINE IN OPERATION, RUNNING WITHOUT FLYWHEEL.

In the Still engine—see diagram—the jacket and cooling water form part of the circulating system of a steam generator, which may be an integral part of the engine or external to it. The cooling water therefore enters and leaves the jacket at a constant temperature, regulated by the pressure of the steam; the cooling is effected by converting the water into steam without raising its temperature. Excluding the radiation losses, which are kept low by lagging, all the heat which passes through the walls is thus usefully recovered in the water as steam. The temperature of the cylinder wall is uniform over the whole of its exterior surface, and the heat lost to the cooling water at each stage of the cycle—compression, combustion, and expansion—is diminished.

During compression, owing to the walls being at steam temperature, the incoming charge picks up heat instead of losing it during the greater part of the stroke, an advantage of the greatest value to the heavy oil types of Still engines, where an air charge is taken in at the full outstroke, and is compressed to a pressure where its increased temperature ensures the certain ignition and combustion of the fuel which is injected into it.

During combustion and expansion the uniform and higher mean temperature of the walls reduces the heat lost to

the jacket water. Some of the heat thus economized adds to the useful work on the piston, the balance passing out in the exhaust gases for recovery.

To ensure the maintenance in a practical and reliable manner of the temperature conditions which produce this efficiency during the combustion cycle, a departure from the design and construction of the cylinders of normal internal combustion engines is imperative. The cylinder of a Still engine consists of an inner liner, which is approximately one-third to one-fourth of the usual thickness; it is ribbed externally so as to add to its conducting surface and provide suitable passage for the cooling water, and it is reinforced by an outer hoop capable of withstanding the highest pressures to be met with in working. No failure of a cylinder of any kind has occurred, even under most severe, even abnormal test conditions, e.g., with mean combustion pressures of 180 lb. per square inch in a two-stroke engine, to which was added overload steam mean pressures of 70 lb., i.e., a total mean effective pressure per revolution of 250 lb. per square inch.

The Still engine may be of the constant volume or constant pressure type, or a combination of both; its losses to the cooling water are not the same as in a normal engine of either type, except in so far that they vary with the type, with the cycle, with the efficiency of the combustion stroke, and with the load. At normal and full loads, such heat units, in a Still engine, as pass into the jacket water, which is at steam temperature and pressure, are lessened and are wholly recovered without loss —radiation excluded—in overcoming the latent heat of the water and give off their steam in the steam space in proportion to the heat flow at these loads. At lower loads less steam is produced, until at still lower loads no steam at all is measurable. In other words, the jacket losses are practically eliminated.

The exhaust gases take a subsidiary, but important, part in the cycle; their usefulness in ordinary combustion engines, in raising steam, is limited to the amount of heat recoverable between the initial temperature of the exhaust and that of, say, 50 deg. Fah. above the steam temperature, after which the whole volume passes away to atmosphere at a still useful temperature, less a small percentage available for feed-water heating. But in the Still engine the exhaust gases, after raising their quantum of steam, are employed in preheating all the water required for the steam generated in the jacket water and in the generator. Trials at full efficiency over long periods and steady loads show terminal stack temperatures as low as 150 deg. Fah. The heat efficiency of the combined cycles is therefore exceedingly good, with an initial temperature of over 2,000 deg. Fah. and a final exhaust to atmosphere at 150 deg Fah.

The quantity of steam capable of being generated from "waste heat" depends upon the efficiency of the combustion cycle, and on the load. Some years of experimental work prove that the weight of steam recovered may vary from a maximum of about 7 lb. per brake horsepower hour developed by the combustion cycle of a four-stroke constant volume engine at full load to a minimum at light loads which is hardly measurable, and which only balances the loss due to radiation.

The engine used for this research was of constant volume type, four-stroke. It first underwent a series of tests, so as to arrive at its "initial horsepower" as an explosion engine, i.e., without any power added by the steam cycle, and was carefully checked in this connection by comparison with well-known and authenticated trials carried out by the late Professor Bertram Hopkinson, F.R.S., and others. Though it was a single-cylinder unit with automatic inlet valves, its "initial horsepower" was rated on a par with the power given by four-cylinder sets with mechanically operated valves deduced from tests over very short periods under their best conditions.

The quantity of steam generated per "initial brake horsepower" from the jacket alone averaged 3.28 lb. per brake horsepower hour, and from the jacket and exhaust together 6 lb. per brake horsepower that, this being the average of the whole of the trials over periods varying from 20 minutes to over six hours. The final six hours of a 7½ hours' continued test gave a total recovery of 6.9 lb. of steam per initial brake horsepower. A whole series of these early trials was carried out under the supervision of C. Vernon Boys, F.R.S., whose sympathetic interest and encouragement is gratefully acknowledged as having largely contributed to the progress made since the inception of the system.

Normal load.—The average mean effective pressure from the combustion stroke was 90 lb. per square inch. The steam evaporated by the "waste heat" gave 14 lb. per square inch mean effective pressure on every return stroke.

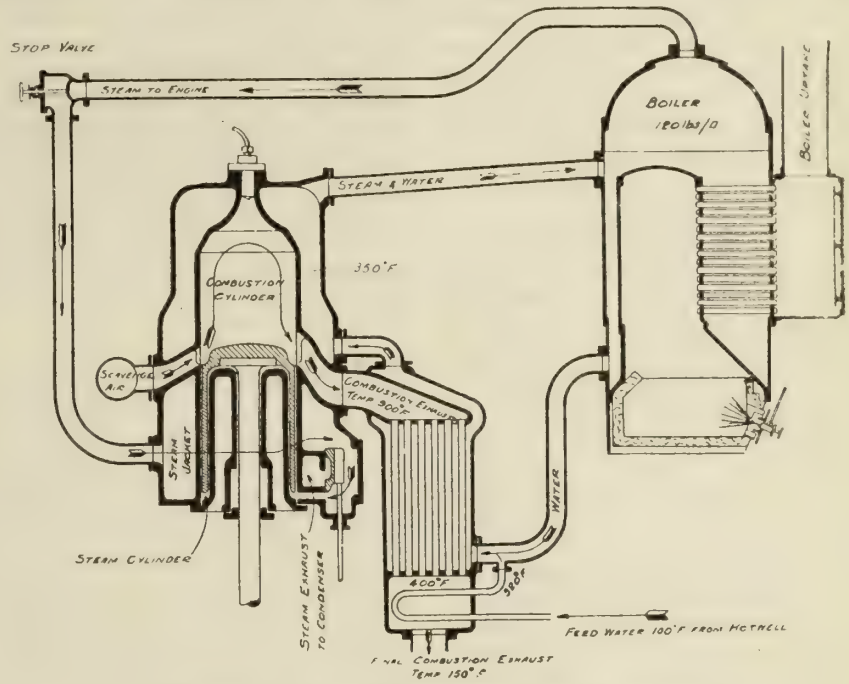


DIAGRAM ILLUSTRATING PRINCIPLE OF OPERATION.

This is equivalent to 90 + 28 = 118 lb. per square inch mean effective pressure in a normal four-stroke engine.

Overload.—By admitting additional steam generated by fuel under the boiler, the steam mean effective pressure was raised to 72 lb. per square inch; the total mean effective pressure was therefore equal to 90 + 144 = 234 lb. per square inch mean effective pressure in a normal four-stroke engine.

Gas Engines

The first experimental engine constructed was a two-stroke engine capable of developing 590 brake horsepower from three cylinders at 400 revolutions, bore 8 in. It was a high-speed engine, designed with special regard to obtaining data about the recovery of steam from waste heat (jacket and exhaust). It was first operated on town gas—540 B.Th.U.'s, and subsequently converted for oil fuel. Its efficiency was not high, owing to its being a two-stroke engine with a short stroke, but its consumption per brake horse-power was 15 cubic feet per hour (31.3 per cent. efficiency), a very promising result.

The outbreak of war prevented much progress being made in the design and construction of gas engines; but the

results achieved give great promise of future development, for with a combustion indicated efficiency of 36 per cent., radiation 4 per cent., boiler loss 10 per cent., there remains 50 per cent. for recovery; allowing 10 per cent. efficiency for the steam cycle, a gain of 5 per cent. is assured, and the total indicated efficiency of the engine will not be less than 41 per cent. If 20 per cent. efficiency is obtained from the steam cycle, as appears possible, the total indicated efficiency will be 46 per cent.

A gas engine which can give a brake thermal efficiency of 30 per cent. better than its predecessors, and which, by governor control alone can meet any demand up to and over 100 per cent. overload, while maintaining a good efficiency at that increased output, cannot be neglected.

Petrol and Oil Engines

Four-stroke engines for petrol and similar fuels have been built and tested ashore and afloat.

A three-cylinder set (marine type) capable of developing on its three small cylinders at 600 revolutions per minute 12.5 shaft horse-power at 90 lb. combustion mean effective pressure, without power from the steam stroke, gave on continuous running 16½ shaft horse-power under "waste heat" conditions, maintaining from the "waste heat" a steady boiler pressure of 100 lbs., with sufficient reserve for manoeuvring in narrow waters or bringing up. It would pick up very rapidly when ignition recommenced, and bring up the boiler pressure to normal in a few minutes.

With the addition of a burner below the boiler it would run continuously and develop 38 shaft horsepower at 750 revolutions. Monetary overload in proportion to the capacity of the boiler reached 60 indicated horsepower (51.5 shaft). Under steam alone the engine is a most satisfactory performer, but not economical.

The Still oil engine starts with the cylinders and pistons preheated. The air charge, from the moment of its entry into the cylinder, picks up heat from the containing walls and continues to do so during at least 70 per cent. of the compression stroke, with the result that the temperature necessary for firing with certainty the first injected charge of fuel is reached with a compression pressure 50 per cent. less than that required in a Diesel engine.

This fact is far reaching in its importance, for it gives to the designer great elasticity and freedom of application, for a Still heavy oil engine can be designed for constant pressure or constant volume, or both can be employed in the same engine by correct timing of the fuel injection. It claims for its combustion cycle an efficiency higher than that of the Diesel, less weight and space per horsepower, and for its combined cycle an efficiency not less than 20 per cent. higher than any prime mover which uses fuel as its source of heat.

The first engine designed for the use of heavy oil was of the opposed piston type, 16 in. diameter, 32 in. total stroke, revolutions 150, the combustion taking place between the two pistons with the steam generated by the jacket water and exhaust gases expanded at the back of both pistons—the steam passed from the auxiliary boiler through high-pressure and intermediate-pressure cylinders, and finally to the Still engine as a low-pressure cylinder—and thence to the condenser.

In a special engine subsequently constructed to meet special conditions—where the maximum power in minimum space was the main desideratum — the dimensions of the cylinder were:—Bore, 13½ in.; stroke, 22 in.; two-stroke cycle, opposed pistons; steam side as for low-pressure cylinder. It forms the basis of a six-cylinder set, two of them using high-pressure steam, which is compounded into the other four as low pressure.

The combustion takes place between the pistons, the steam acting on the return stroke at the back of both pistons. After a series of preliminary tests under steam alone, in which data was obtained for the various mechanical adjustments, the scavenge, compression pressures and temperatures, at various speeds, oil was injected for the first time. The engine fired its first charge without hesitation, and completed a series of tests of over two hours' continuous running, without adjustment, giving an output by gradually increasing the weight of oil admitted of 100, 150, 200, etc., up to 400 indicated horsepower at a maximum speed of 380 revolutions per minute, for which she was designed.

This unit has been subjected to many long and varied tests by representatives of various Governments, as well as to constant research work under severe conditions. Its best consumption of fuel —Admiralty shade oil—has been as low as .302 lb. per brake horsepower—scavenge pump not included—over a test of one hour's duration under normal waste heat conditions. It developed 330 brake horsepower for six hours at 360 revolutions per minute—a single cylinder—under waste heat conditions. It will develop 400 brake horsepower continuously with added steam, and has developed 540 brake horsepower at 380 revolutions over short periods. (Combustion mean effective pressure 128.2 lb., steam mean effective pressure 57.9 lb., total mean effective pressure 186.6 lb.) The thermal brake efficiency from below quarter load to full power is maintained at approximately 40 per cent. over the whole range.

With added steam from the boiler 5,000 brake horsepower would be obtained from two six-cylinder sets, with a weight of about 70 tons, including all auxiliaries and water, and extreme overloads up to 6,000 brake horsepower could be obtained.

The application of the Still system to commercial marine work is being developed in this country and abroad, the two-stroke single-piston type, in powers of 100 horsepower per cylinder and 400 horsepower per cylinder, having been adopted.

Engines of this type at 120 revolutions per minute, with a cylinder 22 in. diameter by 36 in. stroke, giving 4,200 shaft horsepower on two shafts, with all auxiliaries and water, would approximate 600 tons. A geared turbine plant in a similar ship would weigh 20 per cent. more, and would consume approximately 2,000 tons more fuel for a double journey lasting 1,000 hours.

Locomotives

The success already achieved in proving the principles to be correct, both in theory and practice, has led to a careful study, both here and abroad, into the application of this system to locomotive work. No high-powered locomotive engine, using heavy oil or gas in its cylinders, has been produced capable of economical haulage of heavy loads.

A Still engine designed for locomotive work would be capable of giving an efficiency at the rails of 30 per cent. over 90 per cent. of its running time—in other words, six times as good as the present locomotive; while during the accelerating period its efficiency would be at least 15 per cent., or three times as good. In surmounting long inclines with heavy loads, the engine would be capable of developing about four times the power which it develops at its most efficient or normal running load.

It is surely not unreasonable to expect that the application of the system here described should be put, without delay, to practical test for locomotive work, and especially so in view of the development and enormous expenditure contemplated in the electrification of railways. To give up the unit system of traction where the failure of one unit does not involve the failure of the whole, and to rely on what is, after all, a delicate and easily dislocated source of energy from central power stations, merely to gain a problematical 6 per cent. increase of fuel efficiency, seems to involve a risk far greater than the encouragement and development of novel forms of engines, which, whether gas or oil, may be evolved at the present rate of progress before the country is too far committed to such a gigantic and possibly dangerous experiment.

Discussion

The discussion was to a certain extent disappointing, in that it largely took the form of questions, and time did not admit of a reply by the author. Emphasis should, however, be laid on the point that the paper was confined to the setting forth of the principles of the Still engine, and from the remarks made it would seem that their correctness is beyond dispute. Sir Dugald Clerk reminded the audience of the previous attempt of Simon in 1878 to utilize the

waste heat of an internal combustion engine by converting it into steam, failure being due to the admission of the steam into the combustion chamber along with the explosive mixture. An interesting comparison was quoted by him of the Castner Kellner gas engines, which produced, when working on continuous full load, 2½ lb. of steam per brake horsepower at 100 lb. pressure, as compared with the 7 lb. per brake horsepower produced by the Still engine. Incidentally Sir Dugald mentioned that the efficiency of the solid injection submarine engines used in the British Navy was 36 per cent. The only criticism raised by Sir Dugald was that the reduction of the compression pressure from the 500 lb. per square inch in the Diesel engine to 300 lb. in the Still engine, while giving certain advantages, would cause the loss of a certain amount of the efficiency due to the higher compression.

Professor Watkinson had doubts as to whether the steam produced would be sufficient to cool the pistons if the engines were made in larger sizes than those already tested, and the author's reply on this point will be of great interest. He made a suggestion which appeared also to be in the minds of other speakers, that a higher efficiency could be obtained if the steam were to be used in a separate uni-flow engine or a turbine, but such a vital alteration would appear to eliminate some of the important advantages of the present plan. Professor Boys, who has been closely associated with the development of the engine, was interesting in his remarks about the inventor, who he said had foreseen all sorts of possible difficulties and experimented on each one at a time—a very important point—so that when it came to actual construction he was fully armed with facts and results and the course of the experiments ran smoothly. Professor Boys drew attention to the fact that the steam in the Still engine was used under even better conditions than in an ideal steam engine.

Mr. Stokes dealt chiefly with the political aspect of the new principles set forth, and urged the necessity of the Government examining fully into all prime movers before going ahead with their electrical schemes. Mr. Frank Bailey, following somewhat on the same lines, stated that the great economy of the Still engine might make it worth while to install comparatively small power units in factories, and so seriously interfere with the load factor of large central stations and vitiate the whole idea of the Government plan.

Mr. Martineau, who also had been closely associated with the Still engine, showed that the I.H.P.-B.H.P. efficiency of an ordinary internal combustion engine could be increased by 17 per cent. by converting it to the Still system.

Mr. Still, answering a question, said that lubrication of the Still engine had been effectively carried out by a mixture of oil and graphite, adding that the maximum steam pressure he had used was 250 lb. per square inch.

Sir Charles Parsons, in concluding the discussion from the chair, amused the audience by stating that in order to obtain the maximum power for a large cruiser before the war the design would call for 150 cylinders on four shafts.

SUPPLY AND DEMAND

The proposal has been made that in connection with the Canadian merchant fleet fixed freight rates should be established and maintained. The difficulty in such a proposal would be to getting other nations to agree to adopt the same course, which is regarded as impossible. The matter is regulated by supply and demand. Of this question, Robert Dollar says: "The Lord fixed the question of supply and demand ages ago. Unless you can get him to change that law, it is only wasting time trying to fix rates."

Ships in foreign commerce follow the laws of least resistance. Rates now are higher on the Atlantic than on the Pacific, and as a consequence we are seeing many ships coming to Atlantic from the Pacific and tending to equalize the rates. At present there are more cargoes than ships; but at the present rate of building it is possible that the year 1921 will see the position reversed. There will be a big drop in freights and then will come the struggle, the result being the survival of the fittest. Canadian ships would be handicapped by rate fixing.

Robert Dollar thinks the struggle on the Pacific will be begun by the Japs. It is likely it will be a big factor in the Atlantic trade also. The following wage table showing the wages now being paid on Japanese and United States ships respectively is somewhat startling.

Figures for ships of about 8,000 tons, both coal burners.

	Japan		U.S.	
Master	1	$100.00	1	$250.00
1st Officer	1	45.00	1	150.00
2nd Officer	1	32.50	1	135.00
3rd Officer	1	27.50	1	120.00
Carpenter	1	17.00	1	90.00
Boatswain	1	17.00	1	85.00
Able seaman	6	54.00	6	450.00
Quartermasters	4	60.00	..	.....
Seamen	..	.....	2	110.00
Boys	..	.....	2	80.00
Storekeeper	1	12.00	..	.....
	17	$365.00	16	$1470.00
Engineers—				
Chief	1	$ 90.00	1	$185.00
Second	1	45.00	1	150.00
Third	1	32.50	1	135.00
Fourth	1	27.50	1	120.00
Deck Engineer	.	.....	1	85.00
Oilers	..	.....	3	240.00
Storekeeper	..	.....	1	80.00
Firemen	9	47.50	9	675.00
Coal Passers	3	24.00	6	390.00
Donkeymen	1	10.00	..	.....
Stewards—				
Chief	1	17.00	1	120.00
Chief Cook	1	15.00	1	100.00
Second Cook	1	15.00	1	90.00
Cook's Mate	.	.....	1	60.00
Messmen	3	24.00	4	240.00
	40	$764.50	48	$4140.00

THE "WAR WIZARD" MAKES GOOD

Canadians should be very pleased to read the following report with regard to the canal-sized steel freighter, "War Wizard," built at Collingwood under the direction of J. S. Leitch, manager, during the year 1918. The report says that since this vessel crossed the ocean, she has been giving entire satisfaction, that neither hull nor boilers had shown the least sign of leakage, the engines working exceptionally well, and the vessel making, under normal conditions, 250 knots per day, an average of 10.4 knots per hour.

If this is an indication of what can be done by Canadian shipbuilding firms, and we take into consideration that the international power and prestige necessary to the existence of either a race of people or nation, can only be gained and securely held by the predominance of their merchant flag amongst the outside nations of the world, is it not imperative that the people of Canada should do all in their power to encourage "ships" and shipbuilding by seeing that such efficient industries shall have the facilities and protection necessary to enable them to compete with other nations? This can only be accomplished by our manufacturers, producers and shipping interests banding together, as the one can never prosper without the other. These three must form the backbone of Canada and her people, therefore, why should they not put themselves in a position to dictate the laws they must have to ensure their prosperity.

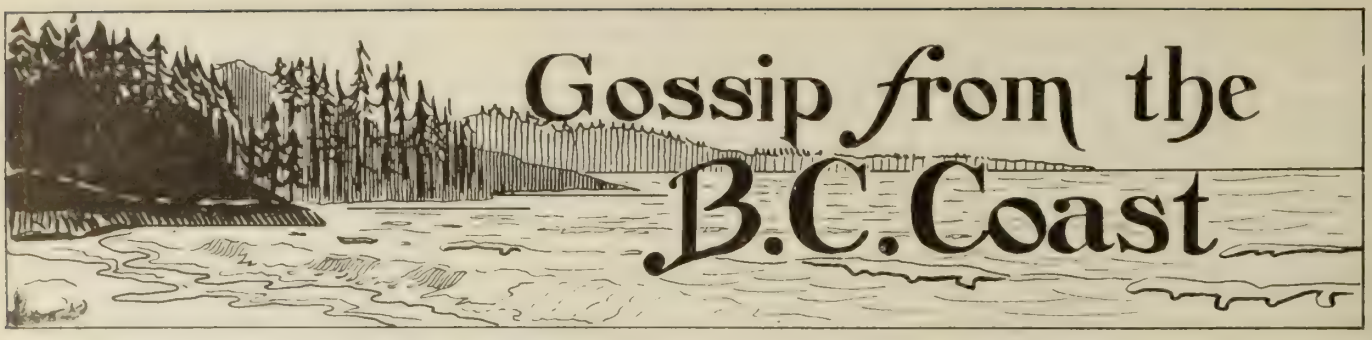
Canada has vast resources of iron and other minerals, together with the necessities of life within herself. Why should it cost 50 per cent. more to produce the finished article than it does in countries where such materials must be shipped in from distant lands?

There can only be one answer. The business system must be at fault, and as the people are, or should be, the ruling power within the Dominion of Canada, the responsibility must rest with them, and the sooner they take this work in hand, the better it will be for themselves, their children, and future generations.

Change of ownership has been made with regard to the S.S. Overland, purchased by Capt. R. S. Misner, of Sarnia, in the spring of 1917; during that year and the season of 1918, under Capt. Misner's command, the Overland proved a very great success.

We understand Capt. R. Lang, who has been for many years first officer and master in the Northern Navigation Co., recently purchased an interest in this vessel, and that she is now under his command, and with Capt. Lang's long experience in marine matters we hope the Overland's success may continue.

This firm is operated under the direction of Mr. James Playfair, of Midland, Ont., one of the most progressive marine men we have in Canada.



ANNOUNCEMENT that the world's greatest dry-dock is to be built at Long Cove, Esquimalt, came a few days ago as the culmination of one of the most protracted controversies in British Columbia's marine history. More than forty years ago the Imperial Government undertook to place a dry-dock at Esquimalt, and one of the terms of consideration was that the Dominion should construct and maintain a thoroughly first-class dry-dock in that harbor so that it would be at all times capable of handling the largest ships plying North Pacific waters. But this agreement was never fulfilled. A few years before the war the Dominion Government went so far as to pass the estimates necessary to an actual commencement of building operations, but the outbreak of hostilities halted everything. At intervals during the war, Vancouver Island interests made representations t Ottawa with a view of getting the long-promised action. War conditions accentuated the feeling that Esquimalt should be better equipped for handling ships of large capacity, especially warships; but the negotiations made slow progress. In fact, at one stage it seemed likely th the Federal authorities would, in the vernacular of the street, "pass the buck" to the British Admiralty.

However, the return of peace evidently made the drydock situation a little less complicated, and the Dominion Government has passed an appropriation of $500,000 to cover the cost of the first year's work on the site. An engineer from the Federal Public Works Department will commence borings immediately, and tenders for the big job will be called for in the early fall.

The dry-dock will cost $5,000,000, and will be the largest structure of its kind in the world. The dimensions will be as follows:

Length, from caisson stop to head wall, 1,150 feet; width of entrance, 120 feet; depth of sill at ordinary high water spring tides, 40 feet; width at coping of dock walls, 144 feet.

The dock will be divided into two parts, 650 feet and 500 feet, respectively, each part closed by a ship steel caisson. The dock will be emptied by three centrifugal pumps, each having a capacity of 60,000 gallons per minute. The pumps and other machinery will be run by electric power generated by the dock power plant. The dock is to be excavated out of solid rock. The walls will be built of concrete with granite copings and alters. All keel and bilge blocks will rest on granite strips extending the full length of the dock. Granite will be used for the caisson stops.

On the south side of the dock a basin will be formed to allow of repairs while vessels are afloat, and to unload cargoes from vessels before entering the dock. This structure around the basin will be built of reinforced concrete piles. The length of the basin will be 560 feet, and the breadth of entrance 200 feet, so that four or five large vessels may be accommodated at a time. To facilitate unloading and the transportation of freight along the piers, railways will be provided, as well as commodious freight sheds.

The strike of seamen, firemen and stewards on the coast-wise steamers was called off early in July, and all services are again in operation under normal conditions. The strikers returned to their jobs at old wages, having been out more than two weeks. The Canadian Pacific and Grand Trunk Pacific fleets were mainly affected by the walkout, although it was at all times possible for the companies to maintain some sort of communication between the ports on the regular schedule.

In order to have a free hand in the expenditure of the $5,000,000 voted for Vancouver harbor improvements, Hon. C. C. Ballantyne, Minister of Marine, has written to the Vancouver harbor commissioners and asked their resignation. The present board is composed of F. C. Carter-Cotton, chairman; J. A. Fullerton and S. McClay, board members, and W. D. Harvie, secretary. It is believed that the new board will include at least one returned soldier, although the personnel may not be altered. The harbor improvement scheme comprises terminal railway facilities and docks and sheds, improved equipment for handling cargo in and out, improved communication with North Vancouver, and better fire protection on the waterfront.

Captain George E. L. Robertson, for eight years agent at Victoria for the Department of Marine, has been promoted to the post of superintendent of pilotage, with headquarters at Ottawa.

The pilots of Victoria, Vancouver and Nanaimo districts have reported against every finding of the pilotage commission with the exception of the clause dealing with pensions. They have filed a protest to Ottawa. The pilots object to the vague manner in which the report is drawn up, and are a unit in opposing the proposal to cut the pilotage force from twenty to fifteen. The report does not name any compensation to be paid for the pilot boats, which are valued at some thousands of dollars, nor does it make any mention of pensions for three pilots over seventy years of age who are to be superannuated.

It is understood here that the Federal Government, at its special session in October, will reach a definite decision relative to a permanent naval policy for the Dominion, and that this will provide for the adoption of a plan similar to that followed in Australia. This would embrace the building of light cruisers and destroyers in Canada by Canadian shipbuilding firms. It is stated that Esquimalt will be retained as chief naval base on the Pacific, and that warships will be built there following the introduction of the naval policy, in connection with which Viscount Jellicoe, expected in Canada this fall, will probably give advice to the Federal authorities.

On one occasion last year the Westminster clock showed the wrong time to the extent of three seconds, but the error was less than a second on 151 days. The clock is checked but not corrected daily. The time ball at Devonport was correct to within a second throughout the year; that at Portsmouth was out of time to the extent of from one-half to one second on two occasions, and the Portland ball was incorrect to a similar extent on four occasions.

Corrugated iron huts, measuring 30 ft. by 15 ft., at £40 each, are one of the features in "Surplus," the second number of which has just been issued by the British War Office. The publication has been extended considerably, and many of the materials are now listed according to the county where they are situated. The Ministry announces that this paper, "Surplus," is issued to catalogue the left over and surplus war material.

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

THE purpose of the marine engine being to drive ships, the student of marine engineering should be acquainted with the various types of vessels, and the special features of the engine to be considered when applied to the different classes.

It is obvious that there will be modifications in the design of a set of engines that is to be used to propel a first-class express liner as compared with those that would be installed in a freight vessel of slow speed and great carrying capacity.

Till fairly recently the type of engine for all classes was the same, that is, the reciprocating compound stage expansion engine, either vertical, horizontal, or diagonal, but the introduction of the turbine brought into use a totally different type, and later still, the heavy oil internal combustion engine made its appearance.

In the case of war vessel design, the only consideration is usually high powers, and though consideration is given to efficiency and fuel economy at low speeds, the engine has to be designed with a large reserve of power for emergency. Considerations of weight and space that would vitally affect the merchant vessel are not of so much importance in the battleship. The war craft is primarily a military machine, and all other considerations are outweighed by that fact.

Types of Merchant Vessels

Coming to the commercial type of steamers, these are divided into certain general types, and these types are again divided in different classes.

First in order comes the express steamer, which is the term applied to all first-class passenger steamers of high or fairly high speed. These are divided into classes such as the North Atlantic type, the longer voyage steamers to the East and Australia, South Africa, etc., and the fast cross-channel vessels, which latter are in some cases paddle vessels.

Then comes the combined freight and passenger vessel, and these can be also divided into classes according to their size. They carry a fair amount of freight and a limited number of passengers. After these come the cargo steamers, which are also divided again according to size and to some extent their trades. Thus there are many large cargo boats which run as regular liners, while the great majority are what are known as tramps. These latter were wont to be built cheaply, equipped cheaply, and run cheaply, the degree of cheapness varying with the owners' cupidity.

The marine engineer has to design the machinery for each of these types with a view to their special purpose, and never lose sight of the commercial possibilities. An engine installation might be practically perfect from a purely engineering viewpoint, and yet be utterly impracticable from the owner's point of view.

Taking first of all the highest type of express steamer, which may be conceded to be the type of which the "Lusitania" was an excellent example. The service required of those steamers is that they shall make a continuous voyage at a maximum speed, and they must be fitted with engines capable of working at their maximum speed and power for the time required to make the voyage. Therefore they must be designed so as to make their maximum speed the most economical speed, or in other words the most efficient. This is what makes the turbine the most effective motor. Before the advent of the turbine the multiple expansion, long stroke and high piston speed reciprocating engine was used. The "Campania" was a good example of this practice, having five cylinders to each of her twin screw engines, with a stroke of 69 inches, which, with 81 revolutions, gave a piston speed of 931 feet per minute. The weight of her machinery worked out at about .202 tons per ton of displacement.

The "Olympic," fitted with reciprocating engines, exhausting into a low pressure turbine, and developing about the same speed, took only .162 tons of machinery to one ton of displacement. The horse power required is about 1.9 shaft horsepower per ton of displacement. In Seaton's "Manual of Marine Engineering," the formula given for the weight of machinery is as follows:

$$\text{For turbine} = \frac{\text{SHP} \times 16.85}{\text{R}-100} \text{ tons where}$$

SHP is shaft horsepower and R = revolutions. For reciprocating machinery it is $\frac{\text{IHP} \times 7.2}{\text{R}-100}$ tons. Besides the main engines the large passenger liners carry a great number of auxiliaries, consisting of refrigerating machinery, pumps, electrical generators, hydraulic machinery for elevators, etc., which are not required in the ordinary steamer.

For fast cross-channel steamers the same conditions as to speed obtain, and it is now becoming the general practice to fit this class of vessel with turbines either of the direct driven or geared type. There are very many of these steamers with paddle wheels, and they are fitted usually with diagonal compound or triple-expansion reciprocating engines. The paddle wheel is advantageous where shallow harbors are to be entered, and in special cases such as for tug boats, which require to manoeuvre quickly, the wheels are made disconnecting by a clutch on the shaft.

The slower North Atlantic steamers, such as are on the Canadian route, are fitted mostly with reciprocating or mixed types, the machinery having about 20 per cent. the weight of the total displacement.

The Cargo and Passenger Ship

This class of ship embodies some of the features of the express steamer, but as her earning power does not depend on passengers alone, considerations of weight and space of machinery enter the design. She is not built with the fine lines of the passenger vessel, and is not required to develop the same high speed. The reciprocating engine of moderate piston speed, developing its highest efficiency at about 80 to 90 per cent. of its maximum power is the most suitable type for this class. This provides for regular running, and leaves a margin for power for emergencies such as head winds and seas, or a little extra speed to make a tide. Their speed is about fifteen knots or less, and the percentage of weight of machinery to that of displacement is considerably less than that of the fast passenger liner. For the faster type running as high as seventeen knots the weight of machinery is about .11 to .16 that of displacement, while for the slower ships it is sometimes as low as .05. Piston speeds are about 550 to 700 feet per minute, the stroke being from 48 inches to 60 inches. The best examples of these vessels are to be found on the long voyages from England to Australia via the Cape of Good Hope, returning in some cases via the Straits of Magelian, thus making the tour of the world. These vessels have about the same auxiliary machinery as the liners, though of course it is smaller in proportion. For instance, there would be only about half the lighting and pumping service required in a passenger and cargo vessel as in a purely passenger steamer of the same kind.

The Tramp Steamer

The purely cargo steamer represents the acme of economical construction and running. Her main features are the ability to make long voyages on a low coal consumption with the least cost of maintenance. The engines are practi-

cally always of the reciprocating type and are usually designed to run at about 80 per cent. of maximum power. The horsepower is low in comparison with displacement, about 1 horsepower to 4 tons. Auxiliary machinery is limited to the necessary ballast and feed pumps, and a small dynamo for crews and officers' berth lights, navigation lights, and cargo clusters in port.

Other Types

There remain the special types such as shallow draught, stern wheel steamers, tug boats, wrecking craft and dredging machines. All these have to be considered in the light of their special requirements, and no attempt can be made here to go into details. Sufficient has been said to acquaint the student with the requirements of the main types of vessels in use, and further details will be considered in later articles.

WORK IN PROGRESS IN CANADIAN SHIPYARDS

British Columbia

Yarrows Limited, occupied on marine repairs.

New Westminster Construction and Engineering Co., New Westminster, B.C. —Building three wooden steamers for Belgian Government.

J. Coughlan and Sons, Vancouver, B.C. —Building four 8,100-ton steamers for Canadian Government, "Canadian Importer, Exporter, Inventor, Prospector."

Standard Shipbuilding Co., Vancouver, B.C.—Three vessels "Donohue," composite type. To be launched December, 1920 and completed January, 1921.

Wallace Shipbuilding Company, Ltd., North Vancouver, B.C. — "Canadian Volunteer" and "Canadian Trooper" launched. Building "Canadian Aviator" and "Canadian Scout," 5,100 tons d.w. each.

Cholberg Shipyard, Victoria, B.C.— Building four 1,500-ton vessels for Norwegian interests.

Prince Rupert Shipbuilding and Engineering Company, Prince Rupert, B.C. —Two 8,100-ton steamers for Canadian Government.

The Foundation Company, Victoria, B.C.—Twenty wooden steamers, 3,000 tons deadweight, for French Government. Seven launched.

Victoria Machinery Depot, Victoria, B.C.—Two 8,100-ton dw. steamers for Canadian Government.

Nova Scotia

Halifax Shipbuilding Co., Halifax, N.S. —Building four steamers for the Canadian Government, two of 8,100 and two of 10,000 tons.

Nova Scotia Steel and Coal Company, New Glasgow, N.S.—Building two 2,800-ton steamers for Canadian Government.

Ontario

Canadian Allis Chalmers, Bridgeburg. —Two 4,300-ton steamers for Canadian Government. Completing four 3,500-ton steamers for Imperial Munitions Board.

Collingwood Shipbuilding Company, Collingwood. — "Canadian Recruit," launched May; "Canadian Signaller" and "Canadian Gunner" building, both 3,750 tons dw.

Dominion Shipbuilding Company, Toronto.—Building six steamers for own account. All to be completed this season. Orders for five additional for fall and next spring delivery.

Midland Shipbuilding Company, Midland, Ont.—One steel steamer to be completed for the Imperial Munitions Board.

Port Arthur Shipbuilding Company, Port Arthur, Ont.—"Canadian Trader" and "Canadian Sailor" launched. Building two 4,300-ton steamers for Canadian Government.

British-American Shipbuilding Company, Welland, Ont.—Building two 4,300-ton steamers for Canadian Government.

Quebec

The Davey Shipbuilding and Repairing Company, Lauzon, Quebec. — Building fifteen wooden steamers of 1,500-tons each for French Government. Two 5,100-steamers for Canadian Government. Operating Champlain drydock.

Canadian Vickers Limited, Montreal.— Building five 8,100-ton steamers for Canadian Government and one 4,300-ton; one 8,300-ton steamer for French Government.

Fraser Brace and Co., Montreal.— Building eight wooden 1,500-ton steamers for the French Government.

Leclaire Shipbuilding Company, Sorel. —Building dry dock of 7,000 tons capacity.

National Shipbuilding Company, Three Rivers, Tidewater. Tidewater Shipbuilders Ltd., Three Rivers.—Building four 5,100-ton steamers for Dominion Government.

BOILER MANAGEMENT AND CONSTRUCTION

The 1919 edition of "Marine Boiler Management and Construction," by C. E. Stromeyer, chief engineer of the Manchester Steam Users' Association, has just come to hand.

The author's reputation and long experience in boiler management and research make this a classic work, and the present edition has been brought up to date in many particulars.

A very valuable chapter to boiler owners in this country is that on corrosion. The action of the various salts are fully dealt with, and many authorities are quoted. The absorption of air and its consequences are also fully dealt with. Fuels and combustion furnish the material for a very informing chapter, followed by one on heat transmission, which contains instructive tables and references to experiments. Strength of materials and the mechanics of the boiler are exhaustively gone into, and a table giving results of a large number of experiments on flat plates is included.

Boiler construction is treated at length, numerous illustrations being used to explain the various operations. Design is also gone into, and a list of published drawings of both double and single-ended boilers is given, which will be of great assistance to designers who wish to compare successful previous practice to their own ideas.

Lloyd's Register and British Board of Trade rules, and standard designs are included in the volume.

This is a book which should be in the library of all designers, builders and operators of steam boilers.

TRADE GOSSIP

Praise for Board.—The British Minister of Munitions has sent a cable to the Imperial Munitions Board congratulating them on the report of their war expenditures. The British comptroller and auditor general report that the accounts of the I.M.B. are highly satisfactory, and the manufacturing establishments controlled by the Board very successful, the accounting arrangements having reached a high standard.

Skilled Mechanics Leave. — It is stated by Mr. G. F. Doolan, one of the delegates who interviewed Sir Robert Borden on behalf of the metal trades, that many of the skilled mechanics who are members of the Amalgamated Society of Engineers are booking or have booked their passage to the Old Country. The reason he gives is that the industrial situation in Canada is such as to make it absolutely unattractive, and they have more confidence in the British Government's efforts to adjust the industrial situation than those of the authorities at Ottawa.

St. John, N.B.—The number of American vessels loading lumber in the port of St. John makes many of the old timers sigh for the good old days of the wooden sailing vessels. These fine ships, owned in Nova Scotia and New Brunswick, carried lumber from St. John and Halifax and other Maritime ports to the United Kingdom, loading thence for the East, and coming home with tea from China or wool from Australia, to reload lumber and repeat the voyage.

A Disappointment.—Such little relief as Canadian shippers may have looked for in August by the release of vessels now used as transports for Canadian troops seems likely to be offset. The British Ministry of Shipping is understood to have decided to take 70 per cent. of all cargo space next month, leaving only 30 per cent. for commercial purposes. This is an unpleasant surprise for the Canadian exporters, as this month only 50 per cent. of space had been commandeered for Government purposes and it was hoped this would be lowered to 40 per cent. in another thirty days. This new move will make the Canadian shipping problem, already rather hopeless, almost insoluble if no change is made.

The Principles of Two-Stage Air Compression

Adiabatic and Isothermal Expansion Defined—Advantages of Two-Stage Compression—Function of the Intercooler and Its Design—The Removal of Moisture

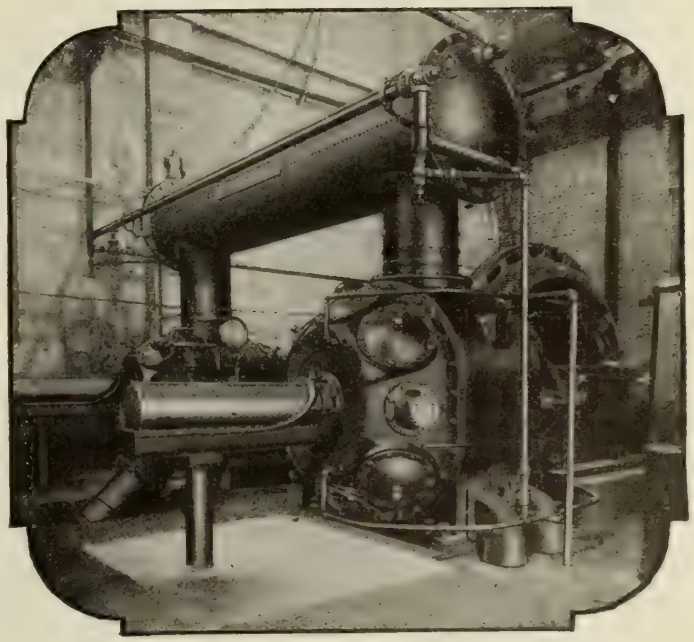
By A. W. SWAN

IN the literature of compressed air there are two terms continually appearing of rather terrifying appearance, "isothermal" and "adiabatic." However, one long word expresses the meaning of a whole sentence of shorter words, and this is the case with these two expressions. Speaking of air compression, "isothermal compression" means "compression with no increase of temperature"; "adiabatic compression" means "compression without loss of the heat generated by the compression." The terms "work" and "heat" are interchangeable, and if air is compressed without any chance for the heat to escape the temperature of the air will increase. In actual compressor practice a certain amount of the heat does escape, but the compression is so rapid that in the ordinary air compressor the compression is nearer the adiabatic (increasing temperature) than the isothermal (same temperature).

There are a number of reasons why the heat of compression should be removed if possible. Air expands when heated, hence if a compressor delivers 1,000 cu. ft. of air at 485 degrees (the temperature of adiabatic compression to 100 lbs. gauge), on cooling to atmospheric temperature the actual delivery will be considerably less than 1,000 cu. ft., so that to have an actual delivery of 1,000 cu. ft. the compressor will have to take in more than this amount, and the power to drive the compressor is correspondingly increased. Hence the lower the delivery temperature the greater the saving in power to drive the compressor. This is by no means the only gain from low delivery temperature; with a temperature such as 485 degrees there is considerable danger of spontaneous ignition of even the best lubricating oil; also the sudden extremes of temperature succeeding each other so rapidly have a harmful effect on the cylinder and piston, and hasten wear.

Compressor efficiency, therefore, depends on the degree to which the heat of compression is removed. Jacket cooling is necessary to keep the metal of working parts at a reasonable temperature, and to prevent the coking of the lubricant, but is not very efficient in removing heat from the air as it is being compressed for two reasons. In the first place air is a very poor conductor of heat, and in the short time of compression in the cylinder only the film of air next the cylinder wall has time to be cooled. Further, the amount of cooling surface becomes smaller towards the end of the stroke when it is most needed. The most efficient method of removing the heat of compression is by splitting the compression into two stages and cooling the air between the stages in an "intercooler." By this means the air does not reach an excessive temperature in either stage; it is delivered at a temperature considerably below the lowest possible with single stage compression with the most careful jacketing, and the resulting economy is correspondingly great. Additional advantages come from the fact that the temperatures in the two cylinders are not high enough to cause danger with the lubricant (and allow the use of ordinary lubricant where a special grade would be necessary to cope with the excessive temperatures of single stage compression). Then again the lower temperatures are beneficial to the wear of the machine, the compounding gives better balance, and the stresses are not so high as with single stage compression.

With such a list of advantages for two-stage compression, it is not surprising that for pressures above 80 lbs. gauge, as a rule only the smaller air compressors are built single stage.



TWO-STAGE AIR COMPRESSOR WITH INTERCOOLER

The success of the two-stage compressor in securing economy greater than that given by single-stage compression depends to a large extent on the design of the intercooler. The intercooler consists of a receiver containing a nest of tubes, through which flows cooling water. From the discharge valve of the low pressure cylinder the air passes through the intercooler, where it is cooled by contact with the cold water pipes. It has been found that the saving in power due to two-stage compression is about one per cent. for every ten degrees of cooling. From this it follows that the design of the intercooler plays a very important part, as the more effective the cooling the greater the saving in power. For instance, if the atmospheric temperature is 60 degrees, and the first stage of compression is to 25 lbs. gauge, then the temperature of the air after the first stage of compression will be about 230 degrees. If the cooling in the intercooler is to 70 degrees (about the best possible in practice), the saving in power will be 14 per cent. over single stage compression, while if the cooling is only to 90 degrees, the saving will be only 12 per cent.

The requirements of the efficient intercooler have been summarized as follows:—

1. The air in passing through the intercooler should be very thoroughly subdivided. Air is a very bad conductor of heat, and every part of the air should have as much contact as possible with the cooling surface.

2. The velocity of the cooling water would be such as to remove heat from the air with the minimum waste of water. The water supply is sometimes a serious problem.

3. The air passages should be such as to give the correct air velocity.

4. Expansion and contraction due to

changes in temperature should be provided for in the intercooler shell and tubes; if this is not done, leakage of air or water will result.

5. There should be a moisture trap to remove all the moisture deposited by the cooling of the air. The removal of moisture is one of the principal benefits of intercooling; the dryer the air, the less the chance of freezing in the hoist, pneumatic tool, or rock drill.

6. The intercooler should be of ample size; acting as a receiver between the stages the intercooler steadies delivery

The moisture trap is seen at "M" in the figure.

At first sight it would seem that the ideal material for intercooler tubes would be brass or copper in preference to iron, as these are better conductors of heat. However, when it is considered that air is a very poor conductor it is easy to see that it is far more important to have the air in the intercooler brought into frequent and intimate association with the cooling tubes than to have the tubes of material having good conductivity. This is borne out in Kent's

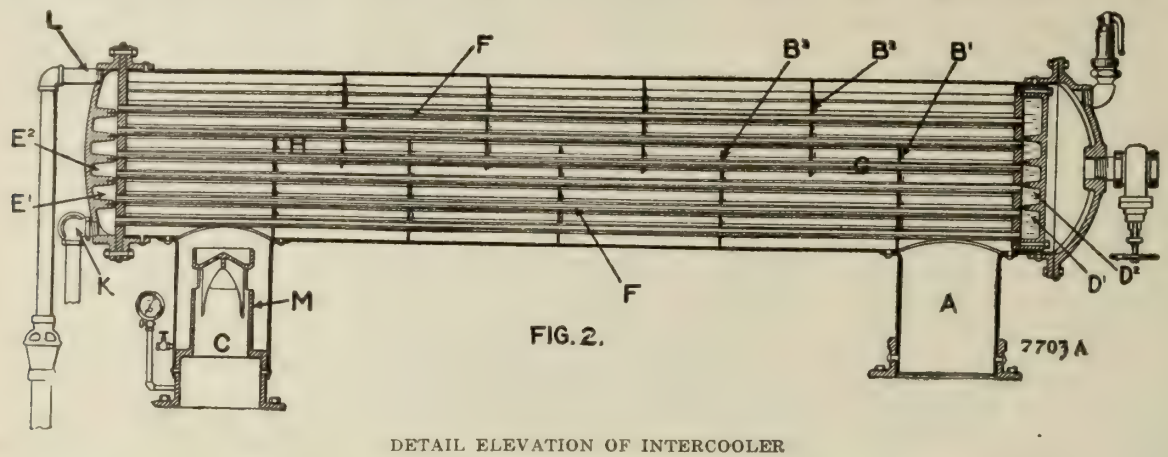


FIG. 2.

DETAIL ELEVATION OF INTERCOOLER

These requirements are shown in a discussion of a standard intercooler (intercooler for PRE-2 Compressor of Ingersoll-Rand). For ordinary pressures this consists of a shell containing a nest of tubes, inside which the cooling water flows. Air enters from the low pressure discharge at A, passes up and around the baffle plate B1, down and under baffle plate B2, over B3, etc. The air is thus taken up into a number of small streams, and by means of the baffle plates is forced into contact with the water tubes a large number of times.

The velocity of the cooling water is important. In a comparative test between this intercooler and an earlier model of the same company, the more modern intercooler averaged one-third less water consumption for the same cooling, and was able to cool the air to a point not reached by the older model

There is considerable dispute as to the correct velocity of the air as it passes through the intercooler, but a mean speed must be found between that at which an appreciable drop is caused in pressure, and that found too low for thorough cooling. As the air cools it decreases in volume, and to keep the air speed constant, good design places the baffle plates nearer together at the high-pressure (cool) end of the intercooler, as can be seen in the illustration.

To secure free expansion, one tube-plate (the right-hand in the illustration) is free, while the other is attached to the shell. The free end is able to slide back and forth with changes in temperature without any strain or leakage; water connections are, of course, made at the fixed end of the intercooler.

Handbook, where it states that: "Taken generally, the results of these experiments show that there are practically but slight differences between iron, copper, and lead, in evaporative activity." Mr. W. B. Johnson formed a like conclusion from the results of his observations of two boilers of 160 h.p. each, made exactly alike, except that one had iron flue-tubes and the other copper flue-tubes. No difference could be detected between the performance of these two boilers.

Protest Against Demurrage.—The proposal of the railways to charge $2 per day on all cars at the seaport not unloaded after twenty days will be protested by the Guelph Chamber of Commerce. The matter will come before the Railway Board at an early date. The ground taken by the Chamber of Commerce is that any delay which may occur after the goods are shipped is due to the railway company and not to the shippers.

Get Big Contract.—The Vulcan Steel Products Co., of New York, has secured a contract for rebuilding the war swept district of Nancy, at a figure estimated at $250,000,000. It is understood that this figure may be increased to $500,000,000 before the task is finished. Two of the largest contracting firms in the United States are associated with the Vulcan Co. in the contract, the McClintock Marshall Co. and the McArthurs Bros. Co.

St. Thomas.—The long search for the missing car ferry, "Bessemer," is at last to be abandoned. Capt. Clarke, of Toronto, has supervised the dragging of Lake Erie from end to end, without succeeding in getting any trace of the vessel, although the operations were continued all last year, and up to the present time.

Halifax. — A tern schooner was launched recently from McKean's Shipyard, Tuft's Cove, after being under construction since August last. The hull is constructed of hard pine and Douglas fir. Dimensions are 155 feet overall by 33 feet 2 inches beam by 12 feet depth. She will be rigged as a three-masted fore and aft schooner.

Who is the Owner?—The New Glasgow "Chronicle" wants to know who is the real owner of the cars now being built by the Eastern Car Co. for the Canadian Government and labelled Canadian National. It points out that on a recent shipment of cars the legend "Canadian Northern Railway" appears. On the flat cars now being built is the name of "General Trust Co., Trustee, Owner and Lessor, Philadelphia, Penn." On the gondola cars still another title appears, "Property of Canadian Northern Rolling Stock Co., Ltd."

Work is being commenced at once on extensions to the rail mill at the Algoma Steel Corporation.

The Bastian-Blessing Company, Chicago, have issued a booklet on the Rego welding and cutting apparatus, which goes into the details of this equipment in a very thorough manner, and lists, together with the prices, the various types of complete welding sets and torches made.

It is said that 21,000,000 yards of burlap could be saved if fertilizer dealers would abandon the use of the 100-pound bag and made use of the 200-pound bag instead. On account of the general use of burlap in shipping articles of food now being sent abroad, there is a great scarcity of burlap.

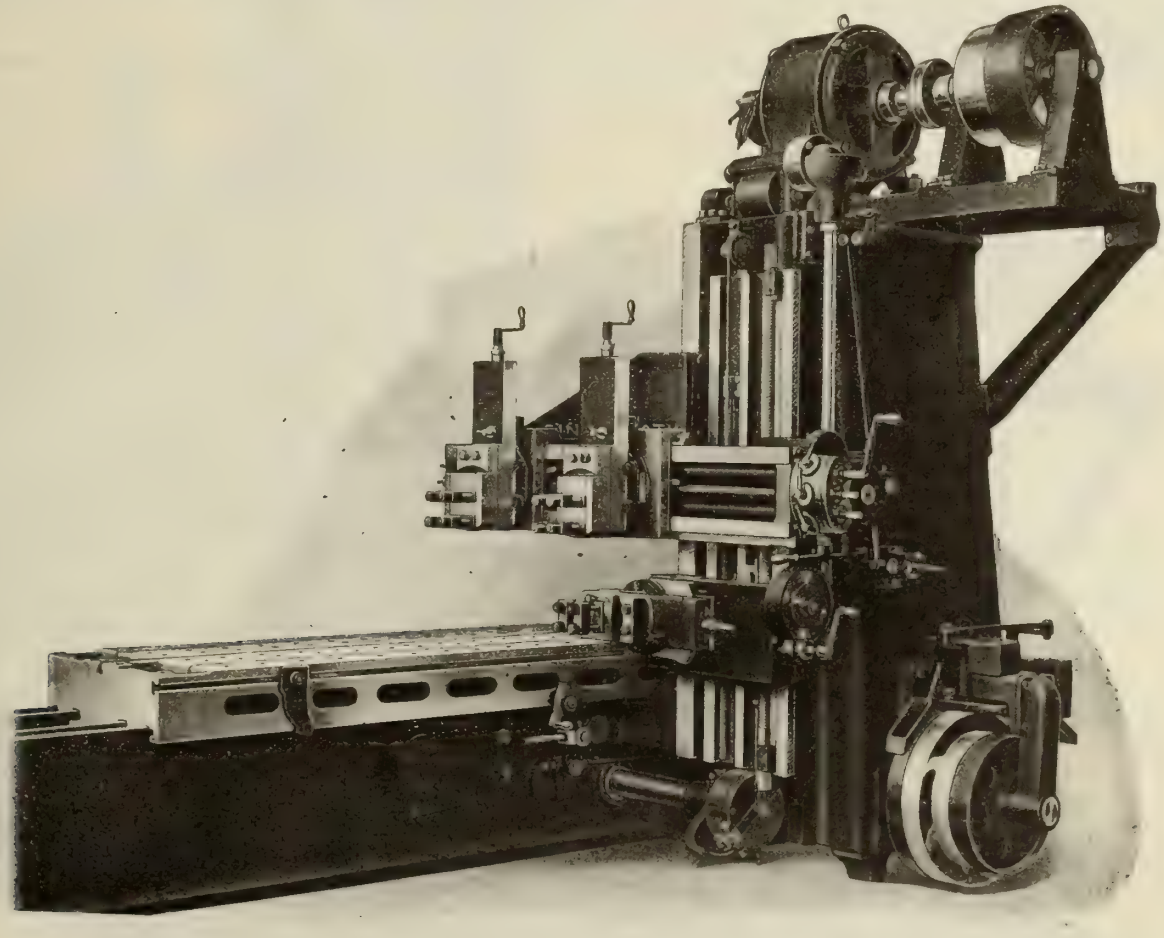
PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

Cincinnati Open-Side Planing Machines

In This Article Is Described a New Product in So Far as the Cincinnati Planer Co. Is Concerned, for This Firm Has Formerly Confined Itself to Planing Machinery of the Double Housing Type.

THE Cincinnati Planer Co., Cincinnati, Ohio, have recently placed on the market a new and complete line of open-side planing machines. This is a new departure for this concern, and it is stated that the best of care has been exercised in the design of these machines, to embody all the features of the double housing type.



GENERAL VIEW OF THE MACHINE.

The machines are manufactured in three sizes, 36 x 36 in., 48 x 48 in., and 72 x 72 in. The points of superiority cited are power rapid traverse for the rail heads, a box-type table, forced lubrication of the Vs, a patent "two speed" drive on the 36-in. and 48-inch machines, quick-reverse aluminum pulleys, an extra capacity table, a box-type bed closed on top, a bed bored for shaft bearings by means of jigs, a bull wheel revolving with the shaft in bearings at the side, bronze bushed self-oiling loose pulleys, a self-releasing combination friction, patent gear-shaped tumbler and dogs, a safety locking device, a down-feed screw and collar of one-piece construction, ball bearings on the down-feed screws, down-feed screws in tension at all times, adjustable taper gibs throughout, a vertical slide maintaining a full bearing on the harp at all times, micrometer collars for horizontal and vertical feeds, simplex feed gears, a patent power-elevating device, and all gearing completely covered. The side head has a long narrow guide for the saddle on the column; an independent adjustable-feed gear, and a handle for the vertical movement; a self-contained counterbalance system, and a releasing latch handle for the tool block.

The rail heads are provided with a

rapid power traverse mechanism.

The Vs of the bed and table are oiled by force lubrication from a pump which delivers the oil into the Vs directly under the tool point, and from this point it is distributed over the entire length of the bed to either end, from where it returns to the tank, the oil passing through two strainers before it is again used. For planing work that is wider than the table, the use of an auxiliary rolling table is recommended, this being supplied at extra cost if desired. The 36-in. and 48-in. machines are regularly furnished with a "two-speed" drive, giving two cutting speeds and a constant speed return, but where a greater number of speeds are needed either reversible or non-reversible motor drive is furnished, these requiring direct current.

The Bed

The bed is of heavy-box section, and is especially strengthened where the gearing and column are mounted. Heavy T-shaped girths at short intervals tie the walls together, and further strength is added by closing in the top between the Vs with an integral part of the casting. The column seat is deep and wide, providing a large surface for the column fastening, and is entirely inclosed on all sides. The length of the bed has very little overhang of the table when planing at full stroke.

The column is of box-type construction and is fastened to the bed by tongues and grooves in addition to the regular bolts and dowel pins. It is made with considerable taper toward the bottom.

The Table

The table is of the box type, the bottom being entirely closed. Heavy ribs at short intervals tie the top and bottom securely together, and prevent springing either when clamping work upon it or while it is at the limit of its travel. The T-slots are planed from the solid (not cored), the centre slot extending the full length of the table. Stop holes are drilled and reamed throughout the entire surface of the table. By drilling extra holes at each corner of the table and by carrying the centre T-slot the entire length, it is possible to plane from 6 to 10 in. longer than the rated capacity of the machine. Making the under side of the table solid also prevents dirt and chips from falling through the holes into the ways. Each section of the rack is bolted and doweled to the table.

The gearing and rack are cut from the solid by a system of special cutters for each gear, this method giving a smooth-running machine, and insuring strength and long life. All the large gears and racks are made from semi-steel castings, and the pinions from steel forgings. All gearing is completely covered for protection against accidents.

The driving shafts are made of 75-point carbon steel, and are ground, after the splining and all work has been done, to insure accuracy. Large reservoirs with self-oiling wicks furnish continuous lubrication to the shaft bearings. Each bearing is provided with a small reservoir, and an oil groove is cut on the inside at the top and bottom. The bearings for the driving shafts are ground internally and are fitted into the bed, the holes in the bed being bored out to a jig. No bushing is less than 7 in. long.

Knee and Cross-rail

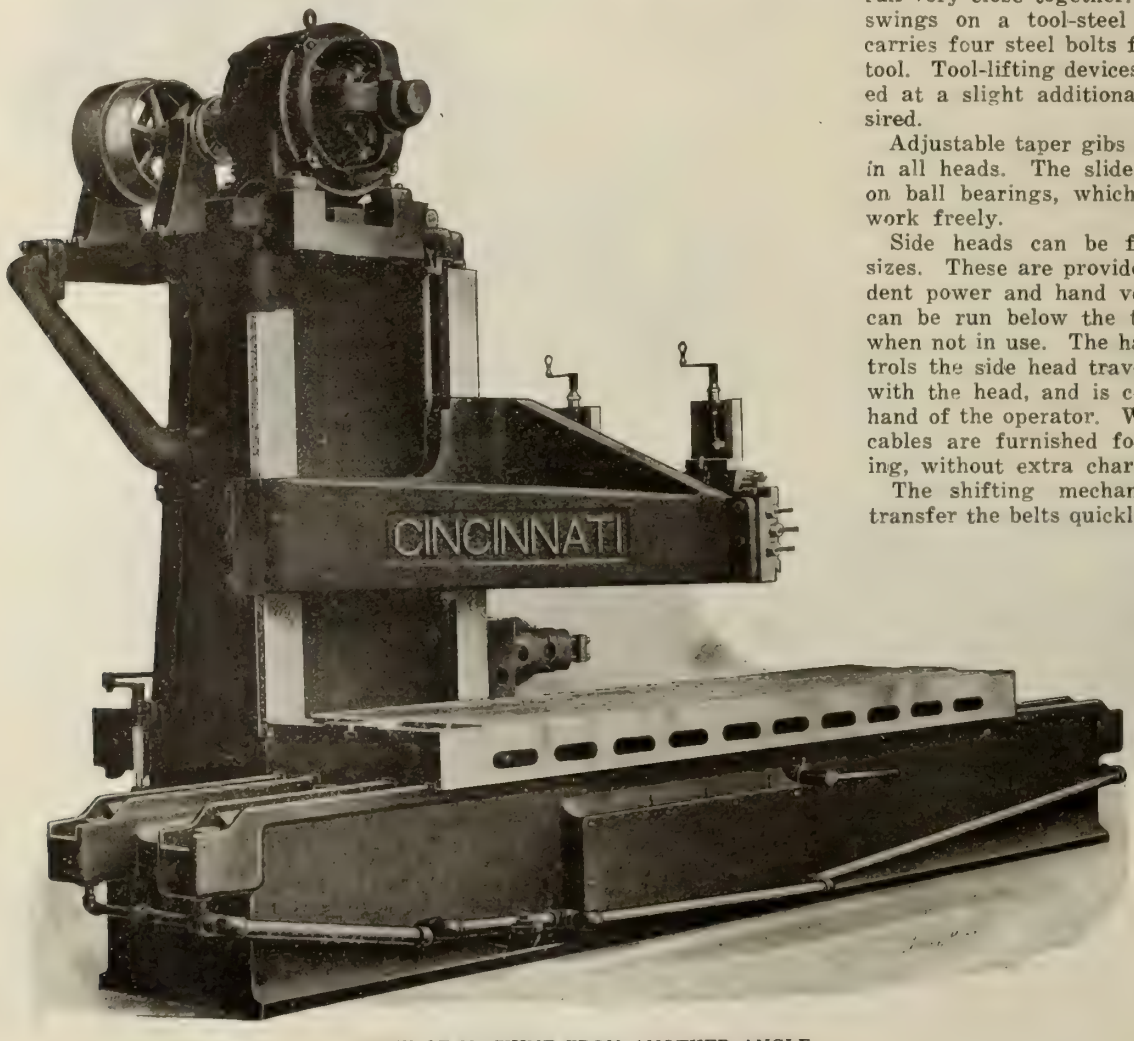
The crossrail is bolted and doweled to the knee and is raised and lowered by means of a power-elevating device operated through frictions by the lever on the right side of the column. The knee is formed at the top to provide a long bearing on the face of the column; it is also provided with a narrow guide arrangement with taper gibs and clamps.

The heads are distinctive, the end of the tool block and slide being made round to avoid projecting corners on angular work. They are scraped to the rail, and graduated for swiveling up to 90 deg. They have automatic feeds in all directions, and can be operated from either side of the machine. The saddles being right and left, the heads can be run very close together. The tool block swings on a tool-steel taper pin, and carries four steel bolts for clamping the tool. Tool-lifting devices can be furnished at a slight additional cost when desired.

Adjustable taper gibs are incorporated in all heads. The slides are also hung on ball bearings, which allow them to work freely.

Side heads can be furnished on all sizes. These are provided with independent power and hand vertical feed, and can be run below the top of the table when not in use. The handle which controls the side head travels up and down with the head, and is convenient to the hand of the operator. Weights and wire cables are furnished for counterbalancing, without extra charge.

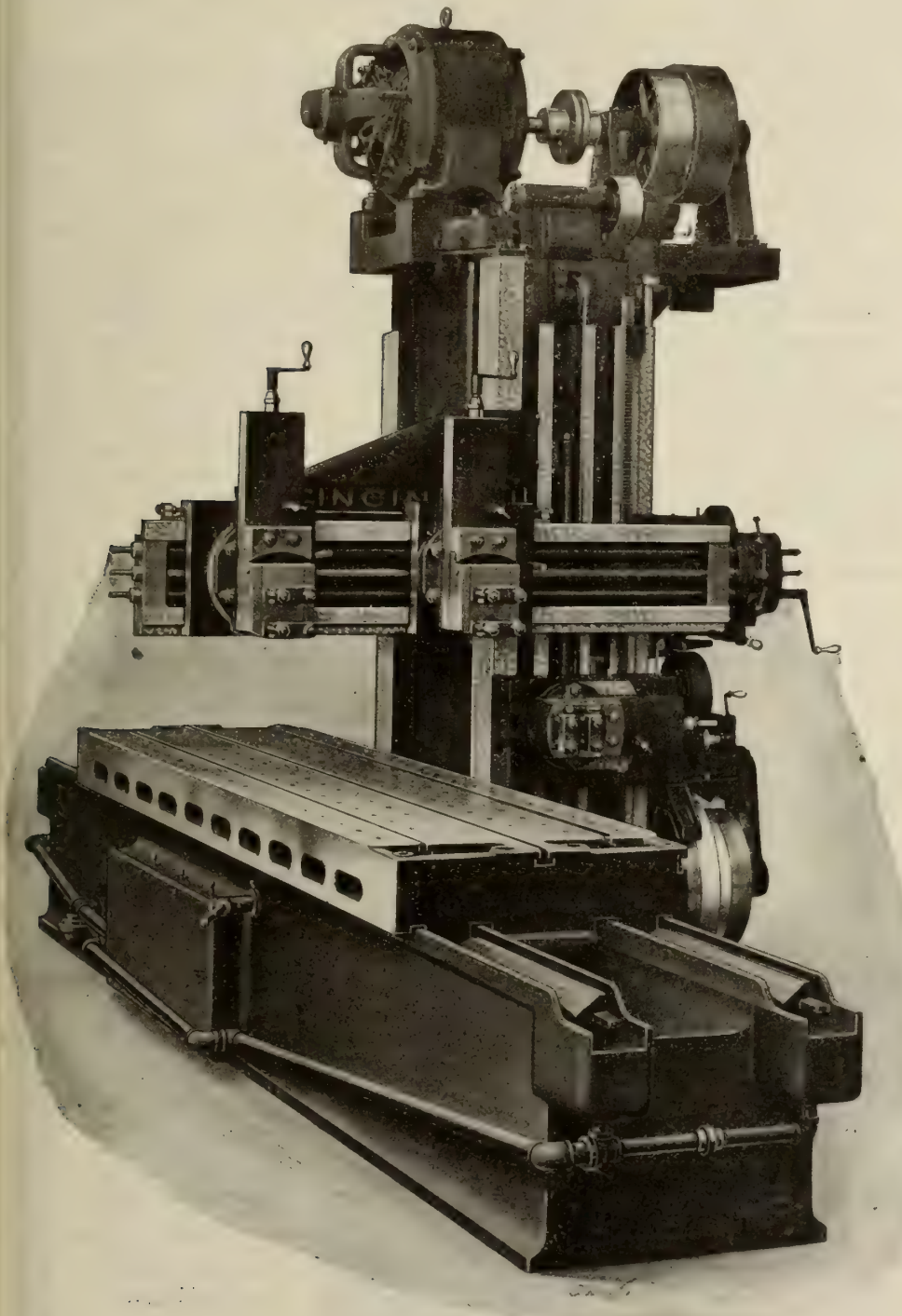
The shifting mechanism is said to transfer the belts quickly and noiselessly



VIEW OF MACHINE FROM ANOTHER ANGLE

when running at the highest speeds. The belt arms are provided with an adjustment that keeps them in proper position at all times, and are provided with an extra support on the bracket which relieves the fulcrum stud from undue strain, doing away with the usual wear at this point. The studs are hardened and ground. The cam and rollers are protected from dirt by a cover, which entirely incloses the mechanism. A drip pan is provided under the shifting mechanism for catching the oil, preventing it from getting on the belts. By means of shifting levers at both the front and rear the operator can control the motion of the table without walking around the machine. The safety locking device permanently locks the entire shifting mechanism, preventing the table from starting, except at the will of the operator. This is a valuable attachment, being a safeguard against accident and spoiled work. It consists of a spring plunger, which enters a seat in the bed, and holds the shifting lever in a fixed position.

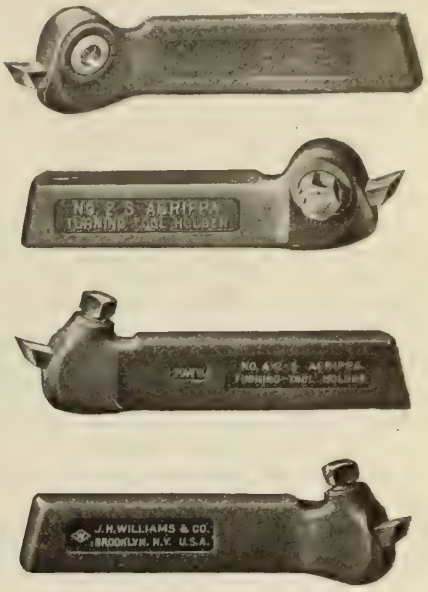
No doubt further detailed information on these machines can be easily secured by those interested, if a written request is forwarded to this concern.



ANOTHER VIEW OF THIS MACHINE

AGRIPPA TOOL HOLDERS

J. H. Williams Co., manufacturers of drop-forgings and drop-forged tools, with plants at Brooklyn and Buffalo, N.Y., have added a line of set-screw pattern turning-tools with right and left-hand offset and straight shanks, to their present well-known "Agrippa" tool holders. These latter already include a full line in a wide range of sizes for all regular machining operations: turning, boring, planing, threading, knurling, cutting-off and side work. Several of these styles, among them turning-tools, are fitted with a cutter-fastening device in the shape of a cam (see cut) instead of the conventional set-screw. The



TYPES OF TOOL HOLDERS.

cams are furnished either of the hex head or headless type.

The nose of the holders, or shanks of both cam and set-screw turning-tools is beveled to permit their convenient use in close quarters. The tools are all drop-forged from a strong, tough grade of carefully selected steel and are submitted, after forging, to a special heat-treatment or refining process which develops not only resistance to all wear but also the great strength necessary to overcome the pushing thrust imposed upon the cutters. The cutter-holding channel is carefully broached to accurate size in special machines and provides an absolutely rigid seat for the cutter, a fundamental requirement in tool-holder efficiency.

For those who purchase cutters made of a steel rolled to the variation in size common to usual mill practice, the makers recommend turning-tools of the cam-fastening pattern as giving the greatest economy, strength and efficiency. It is rapid and positive—the greater the pressure the tighter the lock. But the gradual rise of the cam, while providing great power, obviously limits its range of contact, consequently where the size of steel used in cutters which are not ground to bearing size as in turning-tools varies beyond estab-

lished limits, the makers offer this new line of set-screw pattern turning-tools at the same price as for corresponding sizes of the cam pattern holder.

The screws made of a fine grade of alloy steel, are accurately machined and carefully heat-treated and hardened. They are unusually tough and strong and give the maximum efficiency obtainable from this type of cutter-fastening.

"Agrippa" cutters, made from high-speed bar steel, are cut to the diamond point form or bevel. They thus provide for the most common requirements with a minimum grinding for either right or left-hand usage; also the full extent of economical service that distinguishes this superior line of tool holders.

Every tool is tested before leaving the maker's works; all are unconditionally guaranteed. The addition of this new pattern, it is said, makes Williams' tool holders the most complete and comprehensive line on the market.

SIMPLIFIED ELECTRIC WINDING

The latest practice in geared winding plant for mines is represented in an equipment recently installed in a British colliery, with a shaft 720 feet deep. An old beam-type steam engine was replaced by electric plant driven by a 370 horsepower electric motor operating the drum through double helical gearing, giving a reduction in speed of nearly 10 to 1. A remarkable feature of the change was that the steam engine stopped work on a Saturday afternoon and the electric plant started up promptly on the following Monday morning. This rapid transition was accomplished by building the electric winder house just behind the existing house; only a few hours were required to move the wire ropes from the old drum to the new. In winding plant it is necessary to have a very even and rapid speed control at starting and stopping, and this essential is secured in the electric winder by the use of an ingenious liquid controller of the "weir" type. The liquid is continuously pumped from a lower tank to an upper tank fitted with a sluice gate, which is raised and lowered by the driver's operating lever. When the gate is raised the level of the liquid rises and the electrical resistance falls, thus allowing the motor to gain speed. When the gate is lowered the liquid runs away, the resistance rises, and the speed of the motor is gradually reduced. Auxiliary devices are also used to prevent overwinding and over-speeding. The whole equipment is, in fact, an excellent example of a "fool-proof" electric plant.

Empire Trade Development.—One of the biggest tasks ahead of the Empire in connection with reconstruction is the work of organizing the supply of information on the thousands of matters of importance of the Empire's trade and business that will have to be promptly dealt with. There are, of course, many official sources of which every advantage should be taken, but, in particular, there is the Information Bureau of the Royal Colonial Institute, which has been established for many years and which possesses sources of information that are not available in any other organization. The service provided by this Bureau is not only at the disposal of fellows and associates of the Royal Colonial Institute, but may be made use of by British subjects in any part of the Empire. The Institute, through its Trade and Industry Committee, seeks to promote the economic development of the British Empire and to this end welcomes enquiries on openings for trade and industrial activity not only in respect to manufactured articles, but also raw materials, foodstuffs and transportation and inter-communication facilities. Enquiries should be addressed to the secretary, Trade and Industry Committee, Royal Colonial Institute, Northumberland Avenue, London, England.

Future For Douglas Fir.—Sir James Ball, the British Lumber Commissioner, at a luncheon in Victoria, predicted a great future for Douglas fir. Sir James believes that it will eventually replace American yellow pine in the British market. If British Columbia firms had pressed its claims as they should have done, it would have won its place ere this. There are immense possibilities for the development of this class of business on Vancouver Island and the mainland. Seattle has just received, through one of its lumber firms, an order for 191,000,000 feet of Douglas fir, which is referred to as one of a series of contracts for reconstruction work in the devastated areas.

Current Events in Photograph



First Dirigible to Cross Atlantic

The photo gives a good idea of the great size of the R34. It was taken shortly after the explosion which tore the dirigible from her moorings. The explosion was caused by the gas in one of the front sections becoming heated by the sun. It tore a section of the outer skin thirty feet long from the forward lower surface of the gas bag. This accident has delayed the return trip of the huge aircraft. But it is now on its way, having left Wednesday at midnight.

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The Serious Coal Situation

THE announcement by the British Government that it was compelled to raise the price of coal by six shillings (about one dollar and a half) per ton, has caused consternation among all classes in the United Kingdom. Coal is such a fundamental necessity in the industrial life of the country, that any fluctuation in its price affects every interest in the national life. At the present time, when the steel trades are endeavoring to get on a peace footing that will enable them to compete on even terms with other countries, a rise in the price of coal is almost fatal. With miners constantly demanding shorter hours and higher wages the prospects of a reduction are afar off.

In these circumstances the eyes of the people in Great Britain will turn to the experimental boring for oil in Derbyshire with hopeful longing. If, as the indications are at present, there should turn out to be oil deposits in commercial quantities, there would be a great relief on the demands from the coal fields. The building of oil-fired steamers and vessels fitted with internal combustion engines would be greatly stimulated, and Great Britain would at once be put in a most favorable position from an industrial viewpoint.

Not Rushing To Sea

IT seems strange to read of ships being tied up for want of engineers to run them, but that is the situation that the new fleet or some of the new fleet of the United States Shipping Board are finding themselves in. With salaries ranging from $143.75 per month for third engineers to $287.50 per month for chiefs, with everything found, the men are not coming forward. The board has about 500 engineers in training, but these are not yet available. This seems all the more strange, as the United States do not demand that the engineers should be men of long training. They are creating engineers after an intensive course of some three months spent partly ashore and partly at sea. To those of us who had to serve a long five years' apprenticeship in the shops, and then go to sea for twelve months in charge of a watch, before presenting ourselves for a second class engineer's certificate, this way of making engineers hardly seems adequate. However, with all these inducements it seems difficult to get men to leave their jobs ashore, and this may eventually prove to be a severe handicap to Uncle Sam's laudable desire to rule the sea.

IF THE best we can do for the foreigner who is regarded as undesirable is to deport him, it is a small tribute to our boasted civilization. Of course, there are cases where no other course is advisable, but have we ever made an honest effort to show the foreigner that we have something better here than he was accustomed to in the land he left?

* * *

THE wisdom of bringing the ex-Kaiser to trial in London is open to question. The war is over, conditions have been dictated by the Allies and Germany has signed. Anything done now would be in the nature of a post-climax. It would give the Kaiser a chance to pose as a martyr, a thing that should be studiously avoided.

* * *

THERE is greater ingot capacity in United States than there is capacity to turn out the finished product. During the war the call was for ingots for forging into shell steel. It is hardly likely that it would be practicable or possible to secure full capacity for the furnaces under these conditions.



The Canadian Merchant Service East and West

In This Article Loyalty to the Merchant Service Guild and the Merchant Service in General is Urged—Everybody Must Pull Together for the Ultimate Good of the Profession

REMEMBER—the game is bigger than the player and the ship is bigger than the crew.

These words may well be drawn to the attention of every master, officer and seaman in our Canadian Merchant Service, and for the good of our own society, the C. M. S. G. express them somewhat in the following manner.

The society is bigger than the member of that society and the service is bigger than either officer or seaman.

Now may we ask the tolerance of our Merchant Service for a sermon advocating a religion that has much to recommend it at the moment, a religion that, if consistently practised to-day will result, in the not far distant future, in a merchant service that will become an honor to itself, Canada, and the whole British Empire.

There seems to be a movement in the air; straws are blowing this way and that, organizations for the betterment of our seamen, both deck and engine-room, are mooted, practical steps have been taken toward the formation of the C. M. S. G., a representative society that shall, in the best sense of the word, represent the seamen and mercantile marine profession of Canada.

We urge every seaman, be he a captain, engineer, deck hand, fireman, or cabin-boy, to realize this outstanding fact, that the duty he owes to his service and his fellow members of that service does not cease when he has forwarded his subscription to the society. Payment of a fixed sum of money is good; it enables a society to carry on. Financial assistance is always necessary if successful achievement is to be attained, but there are other things than money, and one thing worth remembering is a spirit of keen loyalty to the society, a determination to do for that society as much as is humanly possible, in the way of standing loyally by it, advocating its laws and preaching its doctrines wherever members of our mercantile marine may be found.

Too often is it the case that a man, enthusiastic about a society, deeply imbued with that society's ideals and principles, joins it in haste, pays his subscription and then sits back and waits for his reward. He expects miracles to happen and the golden age of our mercantile marine to spring up forthwith. Of the difficulties that lie in the way of the society's administrators he does not know; its internal policy does not concern him.

"Oh, I have paid my subscription you know, a fellow can't do more," is a common saying. My dear friend, he can do a great deal more, a very great deal more; he can pin the idea into his brain that, being a member of the society, he assumes a duty to everyone connected with that society, he takes a definite burden on his shoulders, and that burden is to advocate the society's cause intelligently. Let him study deeply into the precepts and ambitions of the organization that is toiling to achieve a betterment of his conditions, until he has the facts at his finger ends; let him expound his feelings in the spirit "my society, right or wrong, my society," because this is his simple duty if he is going to make himself a worthy member.

He must throw away from his being that spirit of selfishness that lies latent, or on evidence in the vast majority of us; he must alter his outlook on life in general, and bring himself to think that the small stones in the complete monument of achievement are as necessary to that monument's being as the heroic statue at its summit, even though their presence is ignored by the casual beholder.

We do not ask any man to make himself a confounded nuisance to his associates by constantly thumping a tub and yelling to the skies that such and such a society is God's own organization for bringing about a new Utopia. Windy arguments are not wanted, but quiet, thoughtful advocacy of his society's claims is desired and necessary if that society is to prove a success.

Our merchant seamen of to-day are an essentially intelligent class. How else could they pass the examination necessary to qualify them for the position of officer, master, or engineer of our vessels?

It should be the definite aim of every society that has as its root ideal the professional and social betterment of its members and our merchant service generally, since the society is not parochial in its outlook, so to sow judicious seed that those upon whom it falls can reflect at their leisure on the arguments advanced and prove to their satisfaction that the society is good.

Idealism, you call this suggestion? Perhaps it is, but we know that the sailor is an idealist. We believe that in his heart of hearts he has visions of a

future for his service that shall lift the honor of the Red Ensign and Maple Leaf at least as high, if not higher, than the honor of the White Ensign.

He may not be actually conscious of this desire; he may, on the surface, pass as a man who is out to snaffle all the fat possible for himself and let the rest go hang, but if he takes himself firmly by the chin during some quiet moment and looks closely into his own soul he will, we venture to assert, find that at the bottom there is another ego which has ambitions for all his kind. And it is that ego which we entreat the members of our mercantile marine to cultivate with all the care of which they are capable. Only thus can Ultima Thule successfully be reached.

Not by arrogant assertions that the C. M. S. G. is it; not by windy debates that lead nowhere; not by fist-hammering on tables that commence with the claim of the C. M. S. G. to public recognition and end by sending down royal yards in a gale of wind. Let it come through clear, thoughtful, incisive arguments, statements advanced with a weight of knowledge behind them, an ability to control one's temper and refuse to be drawn by scoffers. These are the qualities required to carry on the work necessary to make the C. M. S. G. or any other society a success.

We venture to say that 90 per cent. of those carrying on our mercantile marine profession are endowed with these qualities, the very nature of their calling tends to cultivate these thoughts, and behind all must be that genuine reasoned conviction that the society whose claims are advocated is really all that is argued on its behalf, because if such a belief exists amongst its members unanimously, then the C. M. S. G. will become the perfection of societies, since it is composed of perfect members. Is this too much to ask? Some millions of men have laid down their lives on behalf of an ideal that right is stronger than might; could not a few thousand seamen sacrifice certain items in their make-up on behalf of their fellow men?

We do not hold with those who say that every man is a mass of selfishness and careless of humanity in general so that his own bank account swells and his own lines are cast in pleasant places.

The writer has lived amongst sailors for many years, and almost without exception has found them willing to lend a helping hand in a truly generous fashion; has found them ever willing to lend even their very sea boots and oilskins to others less fortunately placed than themselves. If such a spirit exists in small matters, surely it can be cultivated to extend to larger matters of much more vital importance. The formation of a new society does not spell a new heaven and a new sea, but the inculcation of high ideals amongst the members of such a society must make for a golden future.

Improvement Must Come From Within

And so, in bringing about the formation of this ideal society, we come to the realization of that underlying ambition which every right-thinking seaman must have, to form a merchant service that shall endure as a lasting monument to its own honor and integrity.

We are told that in the great hall at Osborne there is an arrogant motto: "There is nothing the navy cannot do." This statement is impressed on youthful minds on entering that service. How many youthful aspirants to our mercantile marine are told on the commencement of their seafaring career the real history of the honorable service they have joined? Are they not assured by all senior to themselves that they are fools for joining such a precarious profession, that they have embarked on a dog's life, that their owners are swindlers, the captain a slave-driver, and the mates, men of no worth whatever? Are they not advised to cut loose from the sea as a calling at the first opportunity? Are they not assured by grim-faced veterans that rather than let their sons go to sea they would cut their throats? The writer has heard these expressions used in his younger seafaring days many times. How is it possible, then, for youngsters treated thus, to cultivate any sense of respect for our merchant service?

Do we not need to familiarize ourselves with our own service and its deeds? There is very little to be ashamed of in our merchant service.

Does every officer in our mercantile marine realize that there is a definite duty laid upon him by virtue of his rank? It is his distinct obligation to inculcate in the minds of all he comes across his firm belief in the organization to which he belongs, otherwise he is sailing under false colors and unworthy of his certificate.

Let him be assured that his owners are sailors' robbers of the blackest dye; let him hold to the conviction that his captain is a "stinker"—he must purge himself of his individualistic outlook and think of the service to which he belongs.

One bad firm of owners does not necessitate a putrid merchant service; one soulless brute of a captain does not necessitate an entire service of soulless brutes. Rather than growl to those under his charge about the dirty tricks that have been played on him, the lack of consideration that has been shown, the worthlessness of devoted service and the doctrine of doing as little as possible for wages received, let him remember the best elements that he has encountered during his years at sea; the thoroughbred captains he has served under and the considerate owners he has worked for; let him point the susceptible youth to the higher ordeal of his profession.

We ask those amongst us who have at heart the welfare of our merchant service to do more than talk; we want them to act, by setting an example to their fellows.

There are many black sheep in our merchant service, and it is these black sheep who damn our merchant service in the eyes of our younger seamen as well as the chance observer ashore—and it is ashore after all that the general public sees the sailor. It is from the sailor ashore that the public forms its opinion, that opinion which creates a service's dignity and repute far more effectively than all the acts of Parliament that ever were passed.

The Captain's Duty

You captains of our merchant service owe a duty to your subordinates as well as to your superiors. Their making is in your hands, for you stand to them in reality as a model. By the very virtue of your position your words are listened to as to the words of an oracle; discipline is inculcated in your officers, and you, as main controller of that discipline aboard your own ship, occupy a position of high responsibility.

Instead of striving, as some do really strive, to belittle your officers in the eyes of the men, try to support them; instead of requiring them to slop around the decks with sougee-mougee and a paint-brush, demand a standard of behaviour that shall leave no loopholes for sinister criticism both ashore and afloat. Encourage; do not threaten. You will pass on, but the merchant service will endure for all time, no matter what changes in its details may come its way. It is up to you to lay the foundation of a merchant service that shall stand as a monument of honor to Canada and her people, not only by reason of its record of good deads, but also by reason of the "rightness" of the men who represent it.

The owners do not pay you to mould the clay that is placed in your hands, but the merchant service requires of you that you should build for futurity—and you can do it, if you will.

You are quick to mark the presence of dirt in your ship; you can tell whether your officers and crew are performing their duties in a seamanshiply manner. Cannot you take a little interest in the human beings about you? Can you not detect dirt in human souls and check deviations from a decent course? Of course you can, and you will, when your thoughts are turned that way.

If we all believe—a not impossible belief—that "There is nothing the merchant service cannot do," and if we aspire to a concrete expression of that belief, if by example and precepts we shape the plastic clay of youth in seemly guise, we shall be able, when the sea fails to draw us to its service, to sit back and watch a newer and better service marching onward, with high-held heads, to a goal that lacks nothing in honor and good repute, and we shall be able to point with our pipe stems to that structure and say: "We too, have fought and won."

Join the C. M. S. G.

And help those who are members of that society to carry out the ideals herein mentioned, so that you may commence building from within—the only sure way to success.

Do not let us forget the past has gone, never to return. The present and the future are here, and they are ours, either to make or to mar.

A Chapter on History of the Mariners' Compass

This, the Greatest Aid to Navigation Known to the Sailor, Developed From Very Crude Beginning—The Date of Its Invention Lost in the Remote Past—Compass Variation

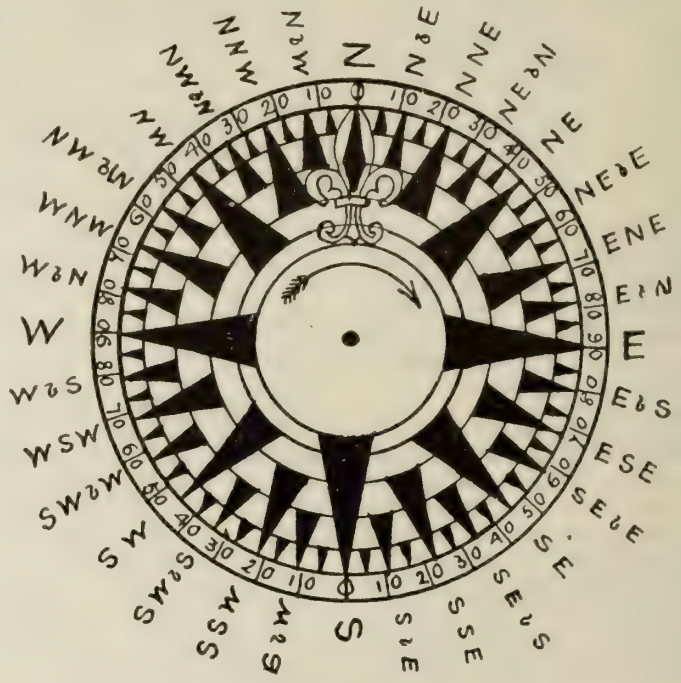
Continued From June Issue

The north of the compass card should point as many degrees to the westward or to the eastward of the North Star as the chart diagram compass calls for, which latter expresses the variation existing for the latitude and longitude of the ship. Again I find an authority to say, "It is now necessary to carry you back nearly five thousand years to the time that the great warrior, Ho-ang-ti, ruled the Chinese empire. It was in the first year of the reign of that emperor, which, according to history was 2698 B.C. or almost three thousand years before the mission of our Saviour, that certain Celestials discovered that if a narrow splinter of the lodestone, or natural magnetic iron ore, found in Asia Minor, was placed upon a piece of wood, and the latter allowed to float in a bowl containing water, that the iron would invariably point in a north and south line. They also devised a circular wooden card on which twenty-four rays were drawn, to each one of these lines was given a name and the whole called ting-nan-chig, which is the Chinese word for 'compass.' The south point of the circle was dignified with a distinguished mark, in the same way that the Christian nations to-day define the north point of their compass by a fleur-de-lis or arrow or rose. To show how little change has been effected by the Chinese in the manufacture of this instrument, it is only necessary to state that their native-made compass of the present time shows only the twenty-four points given to it five thousand years ago."

The earliest reference that Chinese history makes to the practical employment of the compass deals with the year 2634 B.C., at which time the Emperor Ho-ang-ti had reigned sixty-four years. After a great battle with the forces of the Emperor Tchi-yeou, the latter having been beaten, retreated towards the south, but were followed by Ho-ang-ti until a dense fog bewildered the pursuers and hid the escaping armies from them on the great plain of Tchoulou. Ho-ang-ti then had a compass set up in a chariot and the army following this vehicle as it moved towards the south point indicated by the dragon's head, the legion of Tchi-yeou were overtaken and made prisoners.

It was not until about the year 300 A.D. that the Chinese first employed the compass for the purposes of navigation and the Japanese historians claim that while their neighbors invented the compass the Japs showed them how to make use of it to reach lands beyond the horizon.

Although, as it has been explained, the compass was invented nearly 5,000 years ago, it was not known to European nations until the year 1300 A.D. Even 200 years later, at the time that Columbus set sail to discover a new world, the introduction of this instrument had progressed so slowly that many vessels were not provided with it, but shaped their course in the day time according to the trend of the land, and in the night depended upon the bearing of the North Star. How the old navigators managed in fog and cloudy weather, history does not record. The variation of the compass was discovered on board the Santa Maria while that vessel was on her first western voyage as the flagship of Columbus.



THE MARINERS' COMPASS.

From that time on the deflections of the needle from the pole have been regularly observed in various countries, and so carefully have they been recorded that they form to-day a most valuable guide to trace back the vagaries of the magnetic needle and to base calculations upon for the future.

It has been determined substantially that the magnetic poles of the earth toward which all compass needles point, and which are somewhat widely separated from the geographical poles, are not permanent, but they shift slowly from west to east and back again after long periods of time. Thus it is that the variation of the compass is a slowly changing one and that for the same places a great contrast exists between the records of the time of Columbus and those of to-day. In Paris in the year 1660 the needle pointed true north. The next year observations showed that it has assumed a westerly inclination. During the following hundred years the westerly variation increased to 20 degrees and the needle continued to deflect westerly from the North Star until the year 1815. Just after the battle of Waterloo, observations showed that it had ceased its westerly movement and commenced to recede eastward. This retrogression of the compass needle has been constantly going on in France from that time.

These points on the compass may be of interest to you, but there are many more, in connection, which we will touch upon in a later issue.

In Canada the developed water power is estimated at 1,735,598 h.p., while the power available is placed at 18,803,000 h.p.

H. L. Van Keuren, chief of the gauge section, U.S. Bureau of Standards, says that any workman, with a glass true plane and light, can measure accurately to the millionth of an inch.

Educational Items for Future Officers

A Series of Questions and Answers on Subjects Pertaining to Seamanship—Rule of the Road—The Use of the Chart—These Articles Will Appear Monthly

Continued from last month's issue.

IN some of your previous issues we have seen the rules and regulations governing the examinations, which subject has been taken up in a series of questions and answers which have been very instructive and, to say the least, interesting, but the fundamentals of the Rule of the Road are learned as they are laid down in the Articles which will be seen in this issue. We would advise those interested to keep a copy of each month's issue of the review on file, because they will find much valuable information therein, and much of interest to the community.

While anyone, as an executive officer on deck of any vessel, may hold whatever opinion he chooses about the "Rules and Regulations for the Prevention of Collision" on shore, we would impress on your minds that when AFLOAT he must carry out the rules and regulations to the letter as they are given to us, or he will find himself in an utterly false position. We have a reliable authority who said a few years ago: The rules of the road at sea suffer from two difficulties. The scientific men declare it is too practical to be dealt with scientifically, and when it is treated practically practical men declare such treatment is too scientific. But we have evidence that we are gaining ground and we shall some day arrive at a conclusion. When practical men understand that it is a question pre-eminently suited for scientific treatment, and again when scientific men comprehend that it is not beneath their notice to apply themselves earnestly to the solution of a question of such vital importance, the matter then will and must be settled.

REGULATIONS

For Preventing Collisions in Canadian Inland Waters

These rules must be committed to memory and repeated closely to text as may be required.

Preliminary

In the following rules every steam vessel which is under sail and not under steam is to be considered a sailing vessel, and every vessel under steam, whether under sail or not, shall be considered a steam vessel.

The words "steam vessel" shall include any vessel propelled by machinery.

A vessel is "under way" within the meaning of these rules when she is not at anchor, or made fast to the shore, or aground.

Rules Concerning Lights, Etc.

The word "visible" in these rules, when applied to lights, shall mean visible on a dark night with a clear atmosphere.

Lights

Article 1.—The rules concerning lights shall be complied with in all weathers from sunset to sunrise, and during such time no other lights shall be exhibited which may be mistaken for the prescribed lights.

Lights For Steam Vessels

Article 2.—A steam vessel when under way shall carry:—

(a) On or in front of the foremast, or if a vessel without a foremast, then in the forepart of the vessel, at a height above the hull of not less than 20 feet, and if the breadth of the vessel exceeds 20 feet, then at a height above the hull of not less than such breadth, so, however, that the light need not be carried at a greater height above the hull than 40 feet, A BRIGHT WHITE LIGHT, so constructed to show an unbroken light over an arc of the horizon of 20 points of the compass, so fixed as to throw the light 10 points on each side of the vessel, namely, from right ahead to 2 points abaft the beam on either side, and of such character as to be visible at a distance of at least 5 miles.

(b) On the starboard side a GREEN light so constructed as to show an unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the starboard side, and of such a character as to be visible at a distance of at least two miles.

(c) On the port side a RED LIGHT so constructed to show an unbroken light over an arc of the horizon of 10 points of the compass, so fixed as to throw the light from right ahead to two points abaft the beam on the port side, of such a character as to be visible at a distance of at least 2 miles.

(d) The said GREEN and RED side lights shall be fitted with inboard screens projecting at least 3 feet forward from the light, so as to prevent these lights from being seen across the bows.

(e) A steam vessel under way shall carry an additional WHITE LIGHT similar in construction to the light mentioned in sub-division (a). These two lights shall be so placed in line with the keel that one shall be at least 15 feet higher than the other, and in such a position with reference to each other that the lower light shall be forward of the upper one. The vertical distance between these lights shall be less than the horizontal distance.

Lights For Steam Tugs and Vessels Towing

Article 3.—A steam vessel when towing another vessel shall, in addition to her side lights, carry TWO BRIGHT WHITE LIGHTS in a vertical line one over the other, not less than six feet apart, and when towing more than one vessel shall carry AN ADDITIONAL BRIGHT WHITE LIGHT 6 feet above or below such lights, if the length of the tow, reaching from the stern of the towing vessel to the stern of the last vessel towed exceeds 600 feet. Each of these lights shall be of the same construction and character and shall be in the same position as the white light mentioned in Article 2 (a), except the additional light, which may be carried at a height of not less than 14 feet above the hull.

(a) Such steam vessel shall carry a small WHITE LIGHT abaft the funnel or aftermast for the vessel towed to steer by, but such light shall not be visible forward of the beam.

(b) A steam vessel having a raft in tow shall, instead of the forward lights mentioned in clause (a) of this rule carry on or in front of the foremast, or if a vessel without a foremast, then in the forepart of the vessel, at a height above the hull of not less than 20 feet and if the breadth of the vessel exceeds 20 feet, then at a height not less than the breadth, but such height need not exceed 40 feet, TWO BRIGHT WHITE LIGHTS in a horizontal line athwartships, and not less than 8 feet apart, each so fixed as to throw a light all round the horizon, and of such character as to be visible for a dis-

tance of at least 5 miles; such a steamer shall carry also the small white steering light described in clause (a).

Light For Vessels Not Under Command

Article 4.— (a) A vessel which from any accident is not under command shall carry at the same height as the white light mentioned in Article 2 (a) where they can best be seen, and, if a steam vessel, in lieu of that light, TWO RED LIGHTS in a vertical line one over the other, not less than 6 feet apart, and such a character as to be visible all round the horizon at a distance of at least 2 miles, and shall by day carry in a vertical line one over the other, not less than 6 feet apart, where they can best be seen, TWO BLACK BALLS OR SHAPES, each 2 feet in diameter.

(b) A vessel employed in laying or picking up a telegraph cable shall carry in the same position the WHITE LIGHT mentioned in Article 2 (a), and, if a steam vessel, in lieu of that light THREE LIGHTS in a vertical line one over the other, not less than 6 feet apart, the highest and lowest of these lights shall be RED and the middle one WHITE, and they shall be of such character as to be visible all round the horizon, at a distance of at least 2 miles.

By day she shall carry in a vertical line one over the other, not less than 6 feet apart, where they can best be seen, THREE SHAPES not less than 2 feet in diameter, of which the highest and lowest shall be globular in shape, and RED in color, and the middle one diamond in shape and WHITE.

(c) The vessels referred to in this article, when not making way through the water, shall not carry the side lights, but when making way shall carry them.

(d) The lights and shapes required to be shown by this article are to be taken by other vessels as signals that the vessel showing them is not under command and cannot, therefore, get out of the way.

NOTE.—These signals are not signals of vessels in distress, and requiring assistance. Such signals are contained in Article 31.

Lights For Sailing Vessels and Vessels Being Towed

Article 5.—A sailing vessel under way, and any vessel being towed, shall carry the same lights as are prescribed by Article 2 for a steam vessel under way, with the exception of the WHITE LIGHTS mentioned therein, WHICH THEY SHALL NEVER CARRY.

Lights For Small Vessels

Article 6.—Whenever, as in the case of small vessels under way during bad weather, the green and red sidelights cannot be fixed, these lights shall be KEPT AT HAND LIGHTED and ready for use, and shall, on the approach of or to other vessels, be exhibited on their respective sides in sufficient time to prevent collision, in such manner as to make them most visible, and so that the green light shall not be seen on the port side nor the red light on the starboard side, nor, if practicable, more than 2 points abaft the beam on their respective sides.

To make the use of these portable lights more certain and easy, the lanterns containing them shall each be painted outside with the color of the light they contain, and shall be provided with proper screens.

Lights For Small Vessels, or Vessels Under Oars

Article 7.—Steam vessels of less than 40, and vessels under oars or sail of less than 20 tons gross tonnage, respectively, and rowing boats, when under way, shall not be obliged to carry the lights mentioned in Article 2 (a), (b), (c), but if they do not carry them they shall be provided with the following lights:—

(1).—Steam vessels of less than 40 tons shall carry:—

(a) In the forepart of the vessel, or on or in front of the funnel, where it can best be seen and at height above the gunwale of not less than 9 feet, A BRIGHT WHITE LIGHT constructed and fixed as prescribed in Article 2 (a), and of such a character as to be visible at a distance of at least 2 miles.

(b) GREEN AND RED side lights constructed and fixed as prescribed in Article 2 (b) and (c), and of such a character as to be visible for a distance of at least 1 mile, or a COMBINED LANTERN showing a GREEN LIGHT AND A RED LIGHT from right ahead to 2 points abaft the beam on their respective sides, such lantern shall be carried not less than 3 feet below the white light.

(2) Small steamboats such as are carried by seagoing vessels may carry the white light at a less distance than 9 feet above the gunwale, but it shall be carried above the combined lantern mentioned in subdivision (1) (b).

(3) Vessels under oars or sails, of less than 20 tons, shall have ready at hand a lantern with a GREEN glass on one side and a RED glass on the other, which, on the approach of or to other vessels shall be exhibited in sufficient time to prevent collision, so that the red light shall not be seen on the port side or the green light on the starboard side.

(4) Rowing boats, whether under oars or sail, shall have ready at hand a lantern showing a WHITE LIGHT, which shall be temporarily exhibited in sufficient time to prevent collision.

The vessels referred to in this article shall not be obliged to carry the lights prescribed by Article 4 (a) and Article 11 (c).

Lights For Pilot Vessels

Article 8.—Pilot vessels, when engaged on their station on pilotage duty shall not show the lights required for other vessels but shall carry a WHITE LIGHT at the masthead, visible all round the horizon, and shall also exhibit a FLAREUP LIGHT or FLAREUP LIGHTS at short intervals, which shall never exceed fifteen minutes.

On the near approach of or to other vessels they shall have their side lights lighted, ready for use, and shall flash or show them at intervals to indicate the direction in which they are heading, but the green light shall not be shown on the port bow or the red light on the starboard side.

A pilot vessel of such a class as are obliged to go alongside another vessel to put a pilot aboard may show the white light instead of carrying it at the masthead, and may, instead of the colored lights above mentioned, have at hand ready for use a lantern with a green glass on the one side and a red glass on the other, to be used as prescribed above.

Pilot vessels, when not engaged on their station on pilotage duty, shall carry lights similar to those of other vessels of their tonnage.

Lights For Fishing Vessels

Article 9.—Fishing boats shall show such lights as are prescribed for vessels of their tonnage, and shall be under such further regulations as may be adopted for their protection.

Lights For Vessels Being Overtaken

Article 10.—A vessel which is being overtaken by another shall show from her stern to such last mentioned vessel a WHITE LIGHT OR A FLAREUP LIGHT.

The white light required to be shown by this article may be fixed and carried in a lantern, but in such case the lantern shall be so constructed, fitted and screened that it shall throw an unbroken light over an arc of the horizon of 12 points of the compass, namely, for 6 points, from right aft on each side of the vessel, so as to be visible at a distance of at least 1 mile. Such light shall be carried as nearly as practicable on the same level as the side lights.

Question.—What lights are carried by a steamer towing?

Answer.—A steamer towing shall carry, in addition to her side lights, two forward masthead lights, in a ver-

tical line not less than six feet apart, and if towing more than one vessel, and the length of the tow measuring from stern of the towing vessel to the stern of the last vessel towed exceed 600 feet, she shall carry an additional masthead light six feet above or below the other two, and so that the lower light may not be less than fourteen feet above the hull, each of the three lights to show over twenty points of the compass from right ahead to two points abaft the beam on each side of the vessel.

Such steamer shall also carry a small WHITE LIGHT abaft the funnel or aftermast, for the vessel towed to steer by, but such light shall not be visible forward of the beam.

A steamer towing a raft shall carry, in addition to her side lights or in front of the foremast, or if a vessel without a foremast, then in the forepart of the vessel, at a height of not less than twenty feet and not exceeding forty feet above the hull, TWO BRIGHT WHITE LIGHTS in a horizontal line athwartships not less than eight feet apart, and visible all round the horizon for a distance of at least five miles. Such steamer shall also carry the small white steering light not to be visible forward of the beam.

Question.—What lights are small steamers less than forty tons to carry?

Answer.—Small steamers, less than forty tons, shall carry in the forepart of the vessel or on or in front of the funnel ONE BRIGHT WHITE LIGHT to show over twenty points of the compass, from right ahead to two points abaft the beam on each side of the vessel, for at least two miles.

Green and red side lights to show over ten points of the compass from right ahead to two points abaft the beam on their respective sides for at least one mile, or a combined lantern showing a green and red light from right ahead to two points abaft the beam on their respective sides, such lantern to be carried at least three feet lower than the white light.

Question.—What lights are rowing boats to carry?

Answer.—Rowing boats, whether under oars or sails, shall have ready at hand a lantern showing a WHITE light, to be exhibited in sufficient time to avoid collision.

Question.—What lights should be exhibited to attract attention?

Answer.—Every vessel may, if necessary, in order to attract attention, in addition to the lights she is by these rules required to carry, show a flareup light or use any detonating signal, which cannot be mistaken for a distress signal.

Question.—What signal is a steamer under sail and having her funnel up to carry in the day time?

Answer.—A steamer under sail only, but having her funnel up shall carry during the day, forward where it can be best seen, one black ball or shape at least two feet in diameter.

Question.—Describe briefly what signals are to be made by sailing vessels and steamers in a fog.

Answer.—A sailing vessel making way through the water in fog shall at intervals of not more than one minute when on the starboard tack sound one blast of her fog horn; when on the port tack two blasts, and when with the wind abaft the beam three blasts in succession.

A steam vessel making way through the water in fog shall at intervals of not more than one minute sound a screeching or Modoc whistle from three to five seconds.

Vessels at anchor in fog shall at intervals of not more than one minute ring their bells rapidly for about five seconds.

Small boats and vessels of less than twenty tons gross tonnage shall not be obliged to give the above named signals, but if they do not they shall make some other efficient sound signal at intervals of not more than one minute.

Question.—You hear every two minutes two prolonged blasts with one second interval between each; what does it mean?

Answer.—A steam vessel is under way, but stopped, having no way upon her.

Question.—Being a steamer, what action would you take in a fog on hearing the fog signal of another vessel and not being sure of the exact bearing of the sound?

Answer.—So far as the circumstances would admit, I would stop my engines and then navigate with caution, until danger of collision is past.

IN continuing the questions and answers from June regarding the compass there are many corrections to be dealt with in iron ships, one of the more particular perhaps is deviation which every master and officer should be able to understand thoroughly.

Question.—What is deviation?

Answer.—An error of the compass caused by the attraction of iron in the vessel's construction or her equipment.

Question.—Would deviation be the same all over the chart?

Answer.—Deviation has nothing whatever to do with the chart as it is caused solely by the iron or iron equipment used in the make-up of your vessel.

Question.—Would the deviation be the same on all points of the compass in an iron ship?

Answer.—No; it would be different on different points.

Question.—Why?

Answer.—The iron in the ship would have different effects on the compass needle as you swing the vessel round from point to point.

Question.—Explain why this difference should be.

Answer.—Let us head the vessel north or south; you will readily see how the needle or magnets under the card are laying in a fore-and-aft direction or parallel with the fore-and-aft iron in the vessel, therefore, it could not deflect the magnets under the card either to the right or left, but the athwartship iron would now be laying at right-angles to the magnets under the card and as the red end of the magnet is placed under the north point on the compass card it would be deflected to blue ends of the beams or athwartship iron.

Then, let us swing the vessel east or west; you will now notice the needle or magnet under the card will be athwartship and parallel with the athwartship iron, therefore, it would have no power to deflect the needle or magnets to the right or left, the fore-and-aft iron is now at right-angles to the needles or magnet under the card and the north point of the compass must be attracted to the blue end of the fore-and-aft iron.

So you will see when we commence to swing the ship's head away from the east or west the fore-and-aft iron must lose its force on the magnet or needle of the compass and the athwartship iron will increase its force, therefore, the deviation must be different on different points of the compass.

Question.—What is the object of compensating the compass by magnets?

Answer.—To bring the compass under direct influence of the earth's magnetism, causing the directive force to be practically the same on all points, and the deviation small.

Question.—How would you expect a compass having large deviation to act?

Answer.—As the deviation changes from easterly to westerly, when the ship is turned round in azimouth, as altering from one point to another and if the deviation in some cases is large the ship's head will swing faster than the compass and in other cases slower.

Question.—What should the officer never put confidence in while in charge of the bridge and what should he never neglect?

Answer.—He should never put confidence in his compass no matter how good it may have been and never lose an opportunity of determining the deviation. On finding a change, the master should be informed of such

at once; this will be the means of obtaining his confidence, and will make the officer more efficient in his profession.

Question.—Would you expect the deviation to remain the same under all conditions?

Answer.—The officer should never depend on the deviation of his compass, and if he has had no means of ascertaining its amount, act with extreme caution.

Question.—Name some things you would expect to change the deviation when at sea?

Answer.—Carrying a cargo of steel, or any magnetic substance, the ship pounding into a head sea, steering any length of time on one course, a cold night after an excessively warm day, also going from one magnetic latitude to another in a north or south direction, or an electric storm.

Question.—How would you account for a change in the deviation through your vessel pounding into a head sea?

Answer.—If the ship should be heading in the same direction as when building, driving into a head sea would cause the magnetism to be intensified and become more or less of a permanent nature, taking, perhaps, weeks to subside to its original amount; heading in the opposite direction when pounding into a head sea would cause the deviation in the iron to reduce in the same manner.

Question.—How would steering a long time on one course alter the deviation?

Answer.—As soon as an iron or steel ship is put on any course the soft iron in line with the North Pole of the earth starts to form magnetism of a red nature, the opposite part becomes blue. While the ship keeps on this course the compass may only become sluggish and not deviate, but when the course is altered, especially at right angles, the change in deviation is considerable. The new poles will be very temporary and should weaken rapidly as the new poles for the present course are being formed; if the error is not sought for at once it may not be found for a few hours' time, so when altering the course after sunset and not trusting the moon or stars for finding the deviation but waiting for an early sun, you may only find the normal error and wonder why the ship got out of her course.

Let us suppose an iron vessel has been steering north, a red pole would be formed at the bow; then after a lapse of time we head her, say, east, the red pole at the bow will repel the north point of the compass to the port quarter. The wheelsman follows the course by compass thus the vessel is taken to the northward, so we can readily see that in such cases the compass will always hang toward the last course steered. Heavy weather causes much vibration, therefore more retained magnetism, and will take longer to subside to its original amount. When altering from one course to another in such cases generally the sky is obscured so that no observation can be obtained and the land may be obscured also; the careful navigator, keeping all the possible changes of deviation in mind, will not neglect the lead but trust to a line of soundings, wherever the same is practicable, and if his locality is such that a line of soundings cannot be used to locate his vessel's position with some degree of accuracy, then stop until the weather clears.

Question.—How would you take a line of soundings to ascertain the ship's position?

Answer.—Take a strip of paper and paste along the edge of the parallel rule, then take, say, perhaps a mile or half a mile with dividers from the scale on your chart, and lay them off along the edge of the paper; take a sounding and mark the depth at the mark on the paper, now run your distance, take soundings, and put the depth at the second mark. Repeat this three or four times or as often as you thing necessary, then lay the rule on the compass rose, taking the magnetic or true course you are steering and move the rule up or down the chart until you come to the place where the depths on the chart correspond with the depths marked on the edge of your rule. You will find yourself very close to the ship's position. This should be tried in clear weather or where you are sure of the ship's position, so that when it is necessary you will have confidence in what you are doing. If you have a patent sounder very little loss of time is necessary.

(Questions on deviation and variation will be continued next month).

Aids to Navigation Used in the Profession of a Sailor

Question.—What is standard or mean time?

Answer.—Standard or mean time is a day measuring exactly twenty-four hours.

Question.—What is apparent or sun time?

Answer.—A day measuring by the meridian passage of the sun as we see it in the heavens.

Question.—What causes the difference between standard and sun time?

Answer.—The earth, being of an oblong shape and turning on its axis once every twelve months, from which action we derive spring, summer, autumn and winter, its oblong shape causes the sun at certain times of the year to take as much as sixteen minutes more than twenty-four hours from the time it gets to its highest point in the heavens until it reaches there again. At other times of the year as much as sixteen minutes less, so to govern the day we substitute a standard, or mean time (sun) which passes the highest point, or meridian, in exactly twenty-four hours, giving us a standard or mean time to work from. The difference between them is called equation of time and can be found in the Nautical Almanac for every day in the year, so that if you apply this difference as given in the Nautical Almanac for the current day to standard or mean time the result will be apparent or sun time.

Question.—What is meant by the civil day?

Answer.—The civil day commences at midnight and ends at midnight, the first 12 hours being termed a.m. and the last 12 being termed p.m.

Question.—What is meant by an astronomical day?

Answer.—The astronomical day commences at noon and ends at noon, reading from 0 hours to 24 hours.

The Log Book

Question.—What constitutes a ship's log book?

Answer.—A book kept in astronomical time, by the chief officer under the master's supervision with pen and ink, giving a full detailed account of the ship's progress from the time the voyage or trip commences until it is completed. This log book should be signed by the master and the chief officer at the end of each day, great care being taken to keep it clean, the writing distinct, all entries put under proper heading.

Question.—Why should the log be kept in this manner?

Answer.—It is the only proof the captain has to show the seamanship manner in which he has navigated, and performed the duties required from him by his owners, or others interested. Rest assured if it has to be brought before a court of inquiry or a judge on its merits, they will, to a very great extent, decide whether the master is qualified to be in command or not.

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

Jack's Seismograph

A ship's anchor and chain has every right to the above scientific appellation. Through vibration and sound, knowledge of disturbances on the sea bottom are faithfully recorded on deck by the medium of any vessel's anchor chain.

The next time you are trusting your life and ship to anchors on a dirty night just slip out of the pilot-house and take up your watch station on the fore-part of the windlass. Where the windlass is under the forecastle-head is the best opportunity for results. Put your hand on the chains. If it feels like any other inert material, with maybe a slight humming as from telegraph poles, then all is well. This sound is merely caused by the gale and spindrift under the bows. But should there be the slightest rattle to tingle your senses, especially where these sensations are not continuous but intermittent, then your craft is dragging.

In pronounced cases, both the sound waves and friction waves from the anchor travelling over the sea floor, will vary in intensity. With a ship riding heavily in ballast the dragging undulations can even be felt in transmission through the agency of seats screwed down on cabin floors, whilst an engineer can tell you that something is wrong by the feel and tremor of the platform.

In daylight, and under easier weather conditions, your eye alone can easily detect a dragging ship, first by the relative positions of other craft nearby or shore objects. But to the most observant seaman there is still a better and surer way of telling. If your chain stands out well ahead and taut, then suddenly wilts and continues to tighten and slacken, your craft most assuredly must be coming astern, or, as Jack says, "The anchor is coming home."

If you were riding under extreme conditions and afraid of the cable nuts, compressors, or brakes on the windlass, go below in the chain locker and lash both chains together and even if the keelson lashings were to go, through weaknesses in the windlass, the chains would hold together and not run like greased lightning over the bows.

Explanation of Diagrams

1. The common use of two anchors.

2. and 3. Shows how a berth can be fouled by the last arrival. If No. 3 was first-comer, then by buoying his anchor No. 2 might have guessed better what to do. If No. 2 had run his stern anchor from his opposite quarter (port), the situation would have been all right. As it stands now, both ships are in danger with No. 2 responsible, as he arrived last and caused the fouling.

4. This illustrates what happens when you anchor in good clay bottom and pay out too much cable. It simply coils itself down on the bottom and holds the ship safe in quiet weather. The anchor need not be there at all. Say that you moored in this unseamanlike way and a sudden squall struck the vessel. What would happen? She would pick up the loose cable and shoot around the bay like a wild animal, and collide with two or three nearby ships. The other craft present couldn't be expected to know that you had 45 or 60 fathoms of slack chain coiled up on the bay bottom.

5. This craft has swung around with too much chain on a rocky bottom. The cable is jammed under some ledges and she is riding on the bight of the cable. Avoid this by heaving short at swinging time and pay out again. Long range cable is often imperative, but don't expect a vessel to circle round an anchorage on a full length of cable without some attention.

6. Ebb and flood, single anchors. She is now riding with her head upstream. A ship in this position cannot wander around as No. 4 and No. 5 might.

7. Common-garden practice.

8. Hove short at turn of tide.

9. Head and stern anchors. The stern cable is bridled, a practice that distributes the mooring stresses where there are only the ordinary bitts to depend on.

The buoy reminds you that in extreme cases where you have to "slip the cable and anchor," by buoying your loss it may be salvaged. There are times when you must "slip" and get to sea at a moment's notice, a cyclone port, for instance.

Symbols. The large anchor on a chart denotes good ground for large vessels. The small anchors denote good ground for coasters and pleasure craft.

Odd Uses for Anchor Chain

Through breakdowns in the main engines during heavy weather, a steamer may find herself in a very dangerous position. With a roving commission she may burst in a hatch or start some of the houses that are part of the superstructure. Should you find yourself in such a plight, and you are blessed with old-fashioned anchors, it is not an uncommon thing to unshackle one of the cables and veer it out by reversing the windlass. This will help to keep the ship's head up to wind and sea, and especially so if the anchorless chain reaches the bottom. With patent anchors in the hawse pipes this trick is hardly possible as with a ship rolling around in a gale, one could not be expected to hang off a two or three-ton anchor. The old-fashioned anchors are lashed to the deck.

As thousands of steamboats still carry the old-fashioned hooks, it may be in order to initiate our young seafarers into "catting," "fishing," and "ringing" such anchors into their forecastle-head positions. Quite a large fleet of coasting schooners and a few deep-water sailing ships still go through the puzzling antics with anchors, which is so exasperating to beginners who have only met the anchor which heaves itself into the hawse pipe.

Fish Tackle

A fish tackle is purely a sailing vessel instrument. The pennant or standing part is made of shroud wire, having a heart thimble spliced into each end. The aloft end carries a stout lashing which secures the pennant to the topmast doublings. The lower end, which comes within twenty feet of the deck, takes the upper block (a three or four sheaver) of the tackle, whilst the lower block reaches to the forecastle rails. With a chain and hook to do the overboard part of the work, the fish tackle brings the anchor on board by the flukes. If the anchor has to be secured for a passage or voyage, it comes right on board and is lashed to the deck bolts for that purpose. If it has only to be secured against a smooth water trip, it is hove up till the upper fluke can rest on or near the rim of the covering-board. In this position it is lashed by the "shank-painter"—a stout chain which is shackled into the billyboards on the ship's top-sides.

Now what about the ring of the anchor? The "cat-head" looks after that part of the play, so let us just go through the performance. Say that the anchor is hove up as far as the windlass can take it. Then put a man over the bows (a sober one) to place the cat-hook into the ring of the anchor, heave away on the cat-fall and the anchor will soon be suspended from the cat-head instead of from the hawse pipe. Where you desire the ring of the anchor to come up close to the cat-head you must hang off the anchor in the "ring stopper" (small chain), unhook the cat-block and "ring" the anchor up close with any capstan rig which appeals to you.

How Steamers "Cat" and "Fish" Anchors

Naturally a steamboat has an easier plan for handling old-fashioned anchors, and while it is true that a few steamers can still be found in which the operation is performed by two cranes, the great majority use but one crane, which does the "catting" and "fishing" in one hoist. How is this done? Simply by clamping a ring-bolt to a spot on the shank of the anchor which gives the suspended anchor a horizontal balance.

The crane spoken of takes up its place in the fore part of the windlass, and can be guyed to look over either bow. Wire or manilla falls in the tackle, with an appropriate hook on the lower block

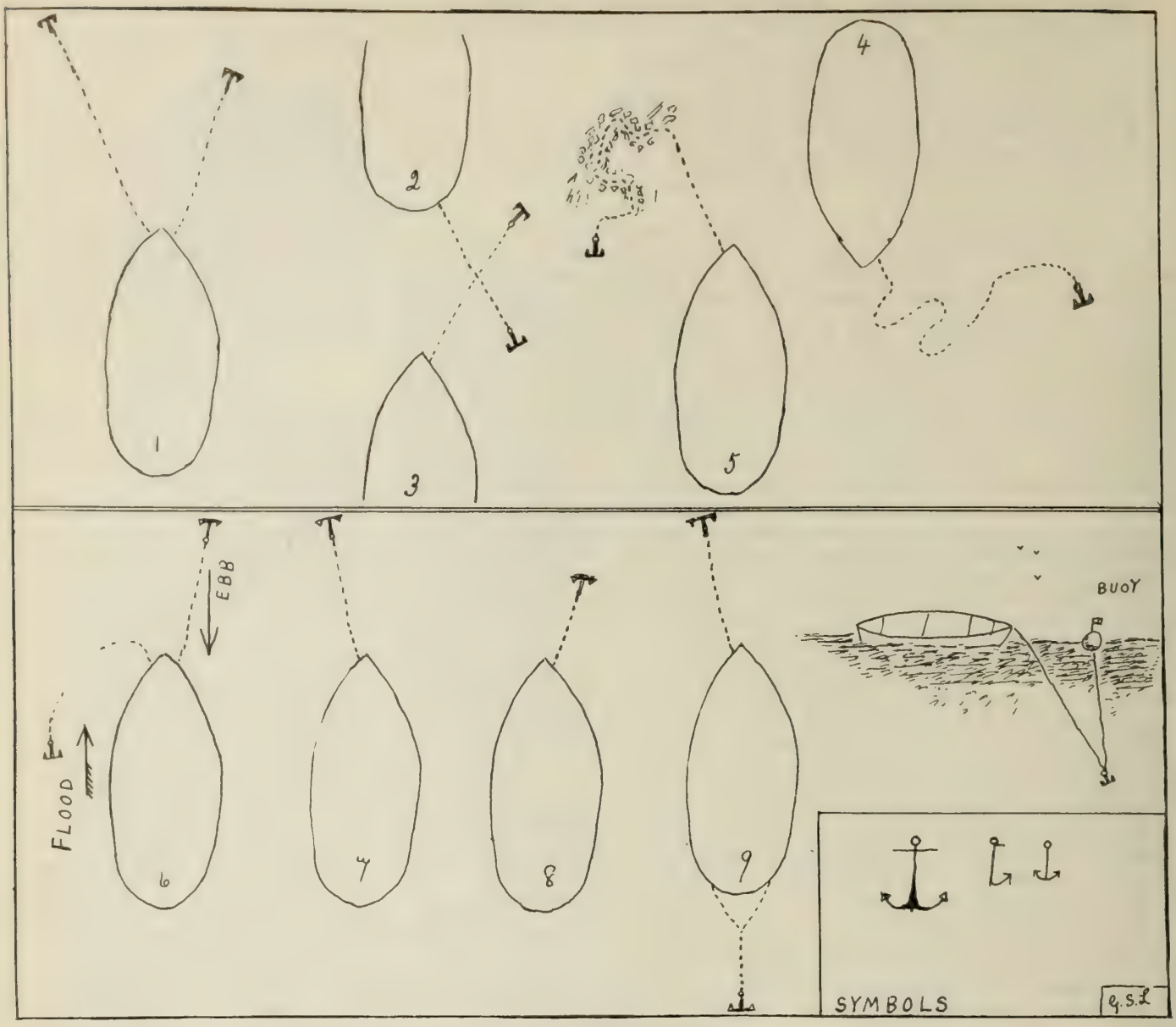


DIAGRAM OF ANCHOR POSITIONS.

is all that is necessary. With this lower block hooked into the shackle on the shank, the anchor comes up with its crown and flukes looking aft. When high enough, the forward guy is slackened and the crane head falls inboard with its burden ready to be lowered into its resting place.

Some cat-blocks and crane blocks have a small piece of heaving line attached to the hooks and thus a handy fellow can jerk the hook into its appointed place from the forecastle deck, thus doing away with the dangerous practice of having to lower a man over the bows, for in these days of hustle the sea is often coming over the bows when the mate and his gang are wrestling with the anchor gear.

In writing of anchors it is perhaps well to draw your attention to the vessels which have to trust entirely to their "ground tackle"—i.e., lightships.

The young seaman to whom these articles are specially addressed must wonder how it is possible for lightships to hang on through gale after gale, and yet it is something out of the ordinary marine news to hear of such a vessel having broken away from her anchor moorings.

Of course vessels of this class have extraordinary gear, but the two main things about their security are the low hawse pipes and spread of bridled anchors. A star-fish shape of three or four heavy chains and hooks and riding to the whole spread by a swivelled cable is one of the methods in vogue.

As a rule, lightships use the mushroom anchors, which, once embedded, need more than an ordinary invitation to "come home."

To show how anchors and chains may figure in strandings, say that your vessel shoved her nose up on a bank or reef, what would be a likely procedure? To get her afloat again it might be necessary to jettison some forehold cargo. Quite right. But say that everything on the calendar has been done to back off the shoal and the precise moment—high water—has again disappointed you, what great chance might you care to take? Dump the anchors and chains and see if she would go astern? If she did and it was impossible to heave in the ground tackle, you would rather sacrifice the contents of the chain locker than the whole vessel and the lives on board. How do you "slip a cable?" Get one of the shackles in a position where there is no strain on it. For instance, a shackle abaft the riding shoe, or abaft the windlass, then the carpenter can easily knock the shackle-pin out with a sledgehammer and drift bolt. To ease the windlass or lift the riding-shoe lever will then allow the anchor cable to quit the vessel.

Question.—What holds the pin of a cable shackle in place? There is no split pin or cotter arrangement.

Answer.—One end of the pin is clinch-headed while the other end has a ⅝ in. hole in it. A corresponding hole in the ball arm of the shackle allows an oak plug to be driven in. Thus play is absolutely out of the question, and whether wet or dry, these wooden

keys require a special invitation to come out.

Question.—What is a cat-head?

Answer.—It is a short, stout and sheave-headed derrick that is built into a ship's bows, about 15 feet abaft the stem or knight-heads. The functions of the cat-head are entirely in connection with raising the anchors from the hawse pipes. A chain connected to the cat-head is called the "ring-stopper," and when the anchor is in readiness to drop it is suspended by this chain. Such a position is known as a "sock-billed" anchor.

Question.—What is a "shank painter"?

Answer.—It is a chain that secures the anchor flukes to the vessels covering-board. Thus the anchor is not free to move as it is when "cock-billed.".

Question.—What is a fish tackle?

Answer.—A masthead tackle that looks after the raising and lowering of anchors from "cat-head" positions to forecastle-head deck.

Question. — In steam-capstan work, what must you guard against when handling anchors?

Answer.—Caution the capstan or winchman against heavy "surging."

Question.—What is "surging a rope"?

Answer.—Allowing the rope to suddenly slacken and thereby endangering heavy weights by putting abnormal strains on guys, falls, hooks and everything concerned.

Question.—What would an Atlantic liner's anchor weigh roughly?

Answer.—From 8 to 12 tons.

Question.—And a tramp steamer's?

Answer.—From 2 to 5 tons.

Question.—Name a device for hanging off a steamer's patent anchor for to allow of windlass repairs or other emergencies?

Answer.—A stout turn-buckle and chain slings.

Question.—How do you hang off a sailing vessel's hook as a rule?

Answer.—By a "devil's claw." This is a specially made claw which attaches to the anchor cable. It has a tail of mooring chain which in turn fastens to a Sampson post or other substantial part of the vessel. Then the windlass can be eased up.

GREAT LAKES TRANSPORTATION COMPANY

Mr. John Bell, who is in charge of this firm's business at Fort William, seems to have been causing a great deal of activity around the river since he took over the ice-breaking contract last fall. We understand he will have three tugs in commission during the summer months and a very fine steel tug is being built in Midland specially designed to keep the harbors at Fort William or Port Arthur open as late, or early, as may be found necessary.

Mr. Bell is getting together a very fine salvage outfit, and while not employed in that special work it will be kept busy towing sand and gravel from the North Shore of Lake Superior.

CONTROLLING CANADIAN SHIPPING NOT TO INTERFERE WITH BUILDING

MR. BALLANTYNE has introduced an amendment to the Canada Shipping Act providing that a shipowner wishing transfer of registry or of mortgage, must apply to the Minister of Marine to get it. In doing this Canada is following the precedent of Great Britain, the action being taken in order that there may be assurance none of our shipping will get into foreign hands. Under the provisions of the bill a foreign company applying for the registry or transfer of a ship must come to Ottawa and apply to the Minister, so that the bona-fides of the applicant and all particulars may be investigated. The bill is to remain in force for three years after the signing of peace.

Objection to the bill was made by Mr. Duff, of Lunenburg, an old opponent of the Minister's, who conducted a spirited attack on the Naval Department this session. He claimed that it would put many wooden shipyards out of business. Most of the wooden ships built in Canada are for sale, and not intended for the Canadian trade. He said it would work a hardship on shipowners. A ship might be in Brazil or France and a sale made by telegraph through the captain, which would require immediate acceptance. Application to Ottawa as required by this bill would, in Mr. Duff's opinion, create such delay as to make sale impossible or difficult.

The Minister allayed his fears somewhat by saying that there would be no delay. The incident opened up a very interesting discussion on shipping, in the course of which some very interesting information was elicited. Mr. Duff said that there was a lot of American money which might be put in Canadian shipping if encouraged. He himself knew of one Boston man willing to invest fifty thousand dollars in Nova Scotia ships.

Mr. Ballantyne assured Mr. Duff and other critics that there would be no interference or delay, as it was the policy of the Government to increase all Canadian shipbuilding. But a certain amount of caution had been shown to be necessary. One of the neutral countries had applied to Canada for registry for a ship which it was found was to engage in enemy trade. The principal object of the bill was to see that none of our ships get into the hands of enemies, and to conserve Canadian tonnage for Canada as much as possible.

Michael Clark objected to the principle that we should try and prevent the enemy countries getting shipping facilities; without them they could never export the goods to pay the indemnities, but the Minister insisted that if he received an application from Germany or Austria, he would refuse it. During the course of his speech he remarked that a large number of wooden ships had recently been transferred from Canadian to Newfoundland registry, which involved a stay of the man concerned only three hours in Ottawa. He assured Mr. Duff that there would be no trouble in any case.

During the debate on the budget the member for South Cape Breton, where the coal and steel works are located, brought up the matter of Canadian shipping commandeered by the British Government during the war, and not yet returned, though badly needed. The Nova Scotia and Dominion companies have lost control of the St. Lawrence coal trade, which has passed to American interests, through lack of shipping. The ships taken were under long contract. The matter has since been brought up in the House and the Premier made a statement, in which he left the impression that the Government was doing everything possible to get the ships out of the hands of Great Britain, but it was hanging on to them like grim death. Mr. Ballantyne and others stated pretty frankly their opinion of the spirit which insisted on retaining the ships to the profit of those who have them, but to the loss of Canada.—T.M.F.

Add to Algoma Plant.—Further important extensions in the Canadian steel industry are foreshadowed in a decision just made by the Lake Superior Corporation to begin work immediately on an extension of the rail mill of the Algoma Steel Company's plant at Sault Ste. Marie, Ont. The purpose of the extension is to make possible the production of structural steel up to 23 inches. Work will be begun at once, and the extension will cost several hundred thousand dollars. It is expected to be completed by November. It was stated yesterday that this is but the first step in a considerable development of the plant with a view to further caring for the Canadian market for this form of steel product, and that the ultimate scheme will be on a large scale. The present extension is not made with any understanding with the Dominion Government, but is said to be based on the expectations of the market for Canadian produced steel, which is expected to extend on a large scale. The rail mill of the Algoma Steel Company is now running at about 46 per cent. capacity, and the other portions of the steel plant are going at about full capacity.

Toronto.—The Dominion Shipbuilding Co. launched their seventh ship in the past nine months last week. This was the steamer "Hessa," a full sized freighter of 3,650 tons deadweight. Her dimensions are 261 feet by 43 feet 6 inches, by 24 feet 2 inches; her engines of the triple expansion vertical type, being designed to develop 1,200 h.p. She is fitted with two Scotch marine boilers, working at 180 lbs. per sq. in. steam pressure. The Dominion Shipbuilding Co. have orders for five more steamers to be delivered this Fall and next Spring.

AN OLD CLIPPER SHIP

From LLOYD'S LIST

The notice in "Lloyd's List" of Wednesday, June 11, of the arrival in the River Thames of the famous "Cutty Sark," now known as the "Ferreira," aroused a great deal of interest among those who are connected with the water here, and many reminiscences have been indulged in on the Terrace Pier among the pilots, and in those places where watermen foregather and spin their yarns. Many of these stories have been told for the benefit of the rising generation of those who will do business on the waters, and they have been impressed with the fact that it was in the days of the sailing ships when real seamanship was learnt and practised. Sailing vessels are still to be seen lying off Gravesend, but not often, and their appearance is always taken advantage of to tell a tale adorned with a moral. But no such opportunity has occurred for many years past as the re-appearance, for the first time since she flew the Portuguese flag, of the rare old "Cutty Sark." She belongs to a generation which esteems itself great.

There is one pilot, however, who has had first-hand experience of the old clipper, and the writer had an interesting chat with him a day or two ago. Mr. W. W. P. Shuttleworth, Trinity House sea pilot, was apprenticed to the late Mr. John Willis, who owned not only the "Cutty Sark," but other sailing vessels, among them the "Blackadder," the "Dharwar," and the "Coldingham." He made his first voyage on the last trip which the "Cutty Sark" took to the Antipodes under the British flag. Her Master was Mr. Woodgate, a fine specimen of what novelists delight to call "sea dogs," and his son, now Master of the "Oanfa" (Messrs. Alfred Holt & Co., "Blue Funnel Line") was Chief Officer. Mr. Shuttleworth joined the "Cutty Sark" at the age of 15, and after serving on board her for nine months, he was transferred to the "Blackadder," on board which he served the rest of his apprenticeship. The "Blackadder" was the last of Mr. Willis' sailing ships to be sold, and it was pathetic to read a newspaper cutting which Mr. Shuttleworth possesses and which states: "'The Blackadder,' so famous when owned by the late Mr. John Willis in the Australian trade, has been sold for a few pounds!" That was in 1899. Not one of the vessels mentioned, however, was so fast as the "Cutty Sark."

Mr. Shuttleworth recalled with some amount of pride that she was a composite-built ship of peculiar construction, with iron frame and bulwarks, teak wood sides, and copper bottomed. She was full-rigged, and her only rival as a flier was the Aberdeen-built ship, the "Thermopylae," with which the "Cutty Sark" was always in contest in the Colonial trade. "It is difficult to say which held the blue riband," remarked Mr. Shuttleworth, "but I am inclined to believe that it was held by the 'Thermopylae.'"

The "Cutty Sark" left the East India dock on June 2, 1894, for her last outward voyage under the British flag. Her destination was Brisbane, and the passage was made in 84 days in the face of contrary winds. She returned with a cargo of wool in 82 days in 1895.

"We made a great effort," said Mr. Shuttleworth, "to get home in time for the March or April wool sales, and I remember we met strong north-east trade winds. The 'Cutty Sark' heeled over to such an extent that her lee rail was under water for three and four hours at a time. On the voyage out she was dismasted, running the easting down, and she lost her fore-topgallant-mast, her fore-upper-topsail yard, and the spanker gaff. We rigged up a jury fore-topgallant-mast and a jury fore-topsail.

"A remarkable feature of the voyage out was the fact that she never lost a man. On four consecutive voyages previously she lost men overboard. Her Master was an expert photographer, and on this particular voyage we fell in with the 'Californian,' a four-masted barque, of Liverpool. The Master sailed the 'Cutty Sark' ahead of the "Californian" took photographs of her from her port bow as she was on the port tack, and then he tacked and came round the stern of the 'Californian' and got up under her lee and took another full-sized photograph of her. The Masters of the two vessels had a conversation through their megaphones, and a promise was made to send copies to the Master of the 'Californian.' Mr. Woodgate photographed every iceberg he came across, and on one occasion put out a boat, and pulled right under the arch of an iceberg to take photographs of it. His collection is, I believe, in the Popular Public Library."

It may be of interest to recall that the name "Cutty Sark" is Scotch for "short shirt." It is to be found in Robert Burns' poem, "Tam o' Shanter," in which, it will be recalled, the poet relates how Tam was pursued by "a winsome wench and walie," dressed in a "cutty sark o' Paisley harn." Tam, witnessing the dancing "warlocks and witches," drew their attention to him by shouting, "Weel done, Cutty Sark," an encomium which must have been used often when the famous clipper performed some of her feats of speed.

It is a notable fact that the "Cutty Sark," when in port, always "flew" at her mainmast head a copper replica of a "short shirt." Mr. Shuttleworth, like others, more than once "shinned" up the mainmast with the copper emblem over his shoulder, and placed it in position. On one occasion it was called a dungaree jumper by an old sailor who knew no better.

CANADIAN SHIPS ARE REGISTERED IN GREAT BRITAIN

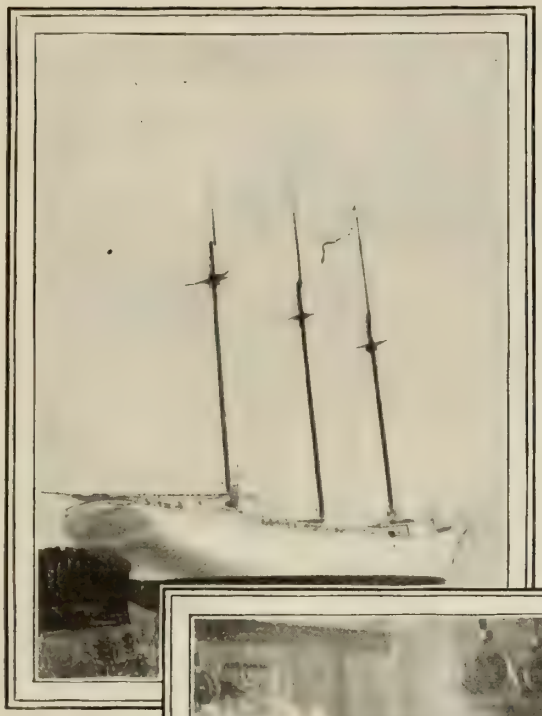
Some days ago Senator Nichols called attention in the Senate to what he termed the disadvantage under which Canada is laboring owing to the failure of the British Shipping Controller to release Canadian tonnage which he had requisitioned during the war, and asked what steps the Government is taking to remedy the matter. He said the British Shipping Board had exercised its powers in a way very prejudicial to Canadians instancing the fact that, owing to 78,000 tons having been taken from the Dominion Coal Company, freight on coal from Sydney to Montreal had increased 600 per cent. This reduced the coal shipment from Nova Scotia from 2,000,000 tons per annum to 100,000 tons, throwing the trade into the hands of the United States, increasing the cost to he consumer and involving an export of gold to pay for the coal purchased abroad of $20,000,000 a year. It entailed a loss of royalties to Nova Scotia of $100,000, rendering necessary increased loans and taxation. The 6,000 coal miners who went to the war are returning but find no work.

Senator Nicholl's speech seems to have stirred up the Government, and on July 1st the Premier read a rather unintelligible cable from Lord Milner, in which he quoted a statement from the Shipping Controller which seemed to disavow responsibility, leaving the matter between the owners and charterers. Of the five vessels in which the Dominion Coal Company were interested, he said, three were already released from requisition and the remaining two would be ofered release as soon as present cargoes were discharged. Sir Robert Borden's comment on the cable was not very illuminating, as he merely repeated the fact that sending the ships to distant ports prevented their use in the coal trade.

As To Responsibility

The Department of Marine points out that no Canadian ships are involved at all. All ships of Canadian registry requisitioned, with the exception of two in the very early days of the war, by the Canadian Government, and not by the British Government. Within a month of the armistice, all vessels of Canadian registry were released from requisition. The ships referred to by Senator Nicholls were under registry in the United Kingdom and in no sense subject to the jurisdiction of the Canadian authorities. It is realized that the Dominion Coal Company has suffered severely by vessels being detained, and the Canadian Government has made repeated representations to the British Government of the necessity of returning the ships without delay;

(Continued on page 56)



Auxiliary Motor Schooner "Samuel Courtney," 1918, equipped with 2-100 H.P. Fairbanks-Morse type "C.O." Semi-Diesel Crude Oil Engines.

Twin Screw, 7 Knots, 531 Gross Tons, 441 Net Tons, 171′ long, 35′ beam. Geo. M. Barr, Owner; Sam'l M. Courtney, Master; O'Brien Noel, N.S., Builder.



Twenty-three Days—Newfoundland to Greece

This is the record of the auxiliary Schooner "Samuel Courtney" and Mr. S. Courtney, her master, attributes it to her

Fairbanks-Morse "C.O." Engines

Fairbanks-Morse C.O. Engines have proved their economy, made possible by their using low priced fuels, and now the long distance speed record has been established. Each C.O.—30 to 200 H.P.—gives perfect regulation under all loads.

The Canadian Fairbanks-Morse Co. Limited

Halifax, St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
Winnipeg Saskatoon Calgary Vancouver Victoria

Marine News From Every Source

Collingwood.—The Collingwood Shipbuilding Company launched the "Canadian Signaller" from their Collingwood yard, making the fourth ocean-going steamer to leave their ways this year.

London.—Sir Auckland Geddes, Minister of National Service and Reconstruction, in reply to a question in the House of Commons, stated that the Government had made a profit of approximately £10,000,000 from premiums on shipping war risks insurance.

Ottawa.—A start will be made this year on the construction of a new dry dock at Esquimalt, the total cost of which will be $400,000. The amount to be expended this year will be in the neighborhood for $500,000.

Port Arthur.—The contract for the new break-water to be built this year has been awarded to Chambers, McQuigge and McCaffrey Company of this city. Arrangements are being made to commence the work immediately. The Thunder Bay contracting company has secured the contract for the revetment wall at Fort William, and have already started operations.

Ottawa.—Although the war is over, the amount of shipping passing through Canadian ports under the control of the Canadian Director-General of the British Ministry of Shipping is larger for the first five months of 1919 than it was in the demobilization period of 1918. The total tonnage for the five months is 1,804,995 tons, nearly as much as the total tonnage for the year of 1916. The total amount of material and supplies, exclusive of horses and mules, cleared from Canadian ports since August, 1914, to May, 1919, is 14,044,758 tons.

Detroit.—The steamer J. T. Hutchinson loaded with ore has gone ashore on Trout Island shoal, and is leaking badly. A wrecking steamer from Sault Ste. Marie has gone to her assistance. The steamer Major is also reported to be off the port of Lexington, and a steamer from Port Huron has gone down to help her off. She went ashore in a thick fog.

Washington.—The American Bureau of Shipping, which has been formed in the U. S. on somewhat similar lines to those of Lloyd's Register in Great Britain, is expected to do great things for American shipping. Commodore E. P. Beethold, commandant of the Coast Guard, will take charge of the Bureau, and is retiring from his present position on June 30th for this purpose.

Victoria.—The first of the twenty ships building by the Foundation Company for the French Government made her steam trials recently. The course used by the Imperial Munitions Board was the one chosen. The vessel on trial was Hull 207. Hull 216 will be ready to take her trials early in July, and there are several other hulls waiting their turn at the fitting-out shed.

Victoria. — The Foundation Company had a successful launching of their eighth ship recently when the Ottawa was put in the water. This is the eighth ship out of the twenty building for the French Government. The launch was in charge of the assistant Northwest manager of the Foundation Company, Mr. Edward E. Jenkins. The sponsor was Mrs. W. J. Stephens.

Victoria.—The Canadian Merchant Service Guild has been incorporated at Victoria, and will be incorporated with the other branches of the guild, making it one big organization. The headquarters of the Western body will be at Victoria, the Middle East at Collingwood, and the Eastern at Halifax. There are already 500 members in the Western body, which embraces the entire coast and lakes of British Columbia.

Victoria.—An unusual scene was witnessed recently when the Prince Rupert was being loaded for her trip to the North. The officials of the Grand Trunk Railway, from C. E. Jenney, the general agent of the company at Vancouver, turned to and assisted in getting the freight and baggage aboard the vessel. The vessel was bound for Vancouver and Prince Rupert, and carried a large number of passengers, as well as supplies for the Northern ports.

Serious Coal Shortage.—A number of circumstances are combining to make the coal situation a serious one. Labor troubles and transportation difficulties aer the chief of these. The production of bituminous coal for the six months of this year was approximately 212.000 000 tons, which is 700,000,000 tons less than for the corresponding period last year. As the estimated requirements for the year are 560,000,000 tons, much greater production will be required for the ensuing six months to make up the average. This is unlikely to be achieved, as the labor force at the mines is about 10% below last year's. Add to this suspension of labor due to wage negotiations which are pending, and the prospects of a serious shortage cannot be denied.

Montreal warehouses are filled to capacity with freight waiting for shipment. This is due to the shortness of tonnage, and there is no prospect of immediate relief. The British Ministry of Shipping still controls 70 per cent. of the available cargo space, and it is a strenuous job for the steamship companies to divide out the remaining 30 per cent. without hurting the feelings of at least some of their clients. Col. W. I. Gear, of the Robert Reford Co., states that the Cunard line has chartered and purchased every available ship, while the Donaldson and Cairn lines each expect a new ship about August.

Vancouver Terminals.—In connection with the construction of the new barbor terminal facilities at Vancouver, Mr. McClay, Harbor Commissioner, states that an effort will be made to have the terminals built entirely by veteran labor. He says that with returned soldiers the work can be done better, quicker and cheaper than by the employment of contract labor. In support of this contention he instanced the construction of Industrial Island under the Crafton Street Bridge, on which the Harbor Commissioners saved 10% of the cost. From the ranks of the Canadian Engineers, who had overcome such grave difficulties in France, Belgium and Palestine, men could be found to fill all the technical positions, as well as the rank and file.

London, Eng.—In reply to a question in the House of Commons, Mr. Bridgeman, Parliamentary Secretary to the Board of Trade, said that the resolution of the Imperial Conference with reference to steamship lines did not aim at creating either lines or subsidies. It simply urged that the best mail service possible should be given, between Canada, Newfoundland, and Australia. An Imperial Investigation Board was being created, which would deal with these questions.

THE "EMCO" VALVE

Has Nine Points of Superiority

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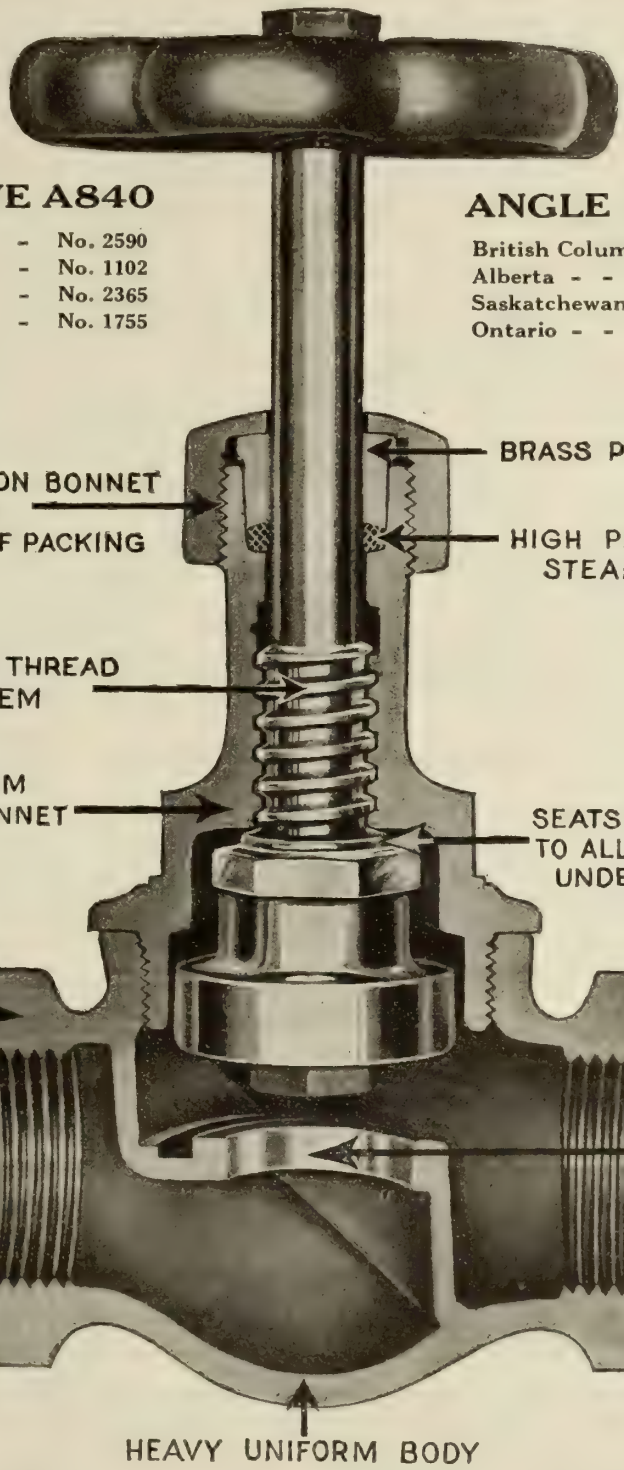
GLOBE VALVE A840

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Ontario	No. 1775



EMPIRE MANUFACTURING CO., LIMITED

LONDON and TORONTO, CANADA

CANADIAN SHIPS ARE REGISTERED IN GREAT BRITAIN

(Continued from page 266.)

but inasmuch as they are registered and controlled in Great Britain they are entirely subject to the direction and control of the British authorities.

There is another side to the question which the Government feels should not be lost sight of. Every soldier sent overseas by Canada was transported in vessels registered in the United Kingdom and under the direction of the British Government. This is true also of practically all supplies sent for maintaining our army over there. For the purpose of meeting emergencies which arose from time to time a few vessels of Canadian registry were on the request of the British Government requisitioned by the Canadian Government; but the tonnage was small as compared with the volume of British tonnage requisitioned and allocated exclusively to war service. The British Government has undertaken to pay for all tonnage of Canadian registry requisitioned for war purposes.

Bringing Soldiers Back

The return of Canadian soldiers since the armistice has been done without the assistance of one ton of Canadian shipping except one voyage made by the Empress of Asia direct to Vancouver via Panama Canal. The large tonnage allocated by the British Government for the transporting of Canadian soldiers to Canadian ports is being fully occupied on return voyages by Canadian products. To disabuse the mind of those who think discrimination has been practised, it is pointed out that during May, 421,402 tons of freight were shipped from Canadian ports in ships under the direction and control of the British Government; while 76,985 tons originating in Canada were shipped through Portland. In May last year 311,705 tons were shipped through Canadian ports in British registered ships. The above represent the average shipments in this way during the past two years.

The Government's contention is that every ton of Canadian shipping was released by the Canadian Government as soon after the war as was possible. The Department of Marine cabled the Canadian High Commissioner on November 21st to advise the Ministry of Shipping that all ships of Canadian registry then under requisition were being released, and they were released from time to time as the voyages on which they had embarked before the date of the armistice were completed. It is pointed out that just before the war British sea going tonnage of 500 and over amounted to 18,500,000 tons. At the time of the armistice it was reduced to 15,000,000. World tonnage has been reduced from 40,000,000 to 36,500,000 millions. United States tonnage has gone up from 1,750,000 to 6,500,000 millions.

It is felt here now that, while there is some suspicion that the Dominion Coal ships have not been dealt with as fairly as they might have been they will not be further detained as far as the Shipping Controller is concerned. The proposal has been made that we should advocate an embargo on foodstuffs against Great Britain, but it has not met with acceptance. The Government would hesitate to begin what would be construed as an unfriendly act; and the millers and the West would never stand it.

MYSTERY OF SEA IS NOW CLEARED UP

Three months after the fifty-year-old Norwegian ship "Superior" became a mystery by disappearing off New York, the vessel arrived here to-day, with her captain unaware that his ship had been given up as lost. The crew was recruited at San Francisco before the ship sailed from that port for the Philippines in December, 1918.

Captain Hansen explained that after he and the crew, believing the "Superior" was going on the rocks, put out in two lifeboats towards shore, the wind veered and his own boat returned to the ship. Meanwhile the mate and six of the crew went ashore, and, believing the vessel to have been lost and that the captain and other members had perished, sent a cablegram to the Norwegian Trading Company here, charterers of the vessel, saying she had disappeared, and that "it was a mysterious case." A search by Government authorities in the Philippines failed to locate the vessel.

Captain Hansen thought the mate and his six companions were drowned. Prior to her "disappearance" the "Superior" had landed at Manila a cargo of hemp and sugar taken on at San Francisco.

Ottawa.—Besides the six ships of the new Canadian Government marine already launched, it is expected that thirty more will be completed this year. The remaining vessels will be completed before the end of 1920.

Vancouver.—Addressing the retail bureau of the Board of Trade at a luncheon, Commissioner McClay stated that the construction of harbor facilities would be started as soon as the Government allocated the $5,000,000 appropriation to the work. These facilities consisted of a terminal railway, four new deep sea berths with fire-proof sheds, a lumber assemblage wharf for export lumber, a large central booming ground for saw logs, oil storage tanks for non-inflammable oils, and the purchase of a suitable fire and tug boat combined. The speaker in calling attention to the importance of shipping to the port, mentioned that a ship of the Robert Dollar Line spent as much as $40,000 in the port each trip.





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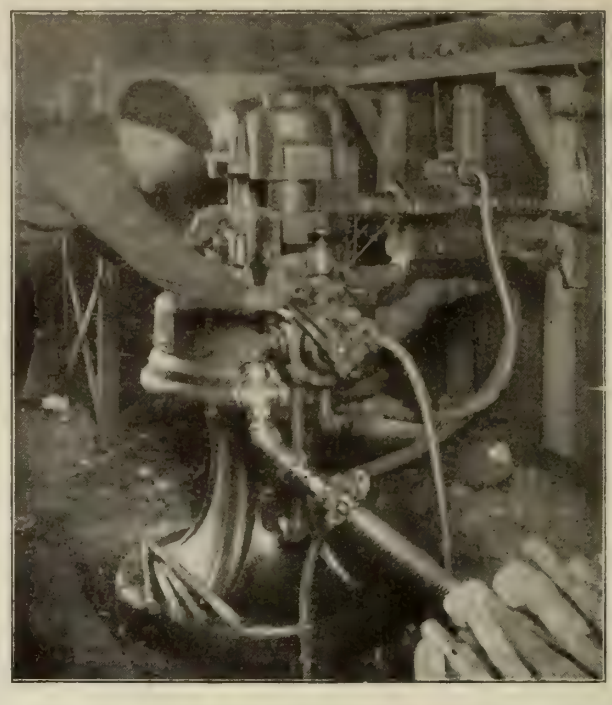
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This description of the Leyner Bolt-Header at the shipyard of Fraser, Brace and Co. is taken from March "Marine Engineering."

THIS IS THE MACHINE

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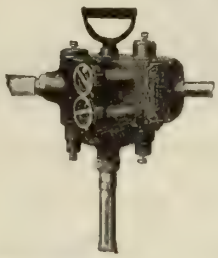
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For Ship Yards and Boiler Shops



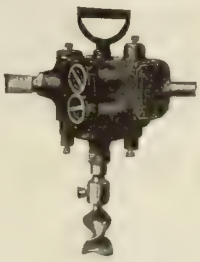
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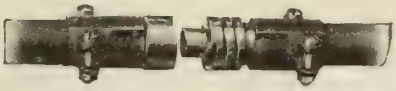


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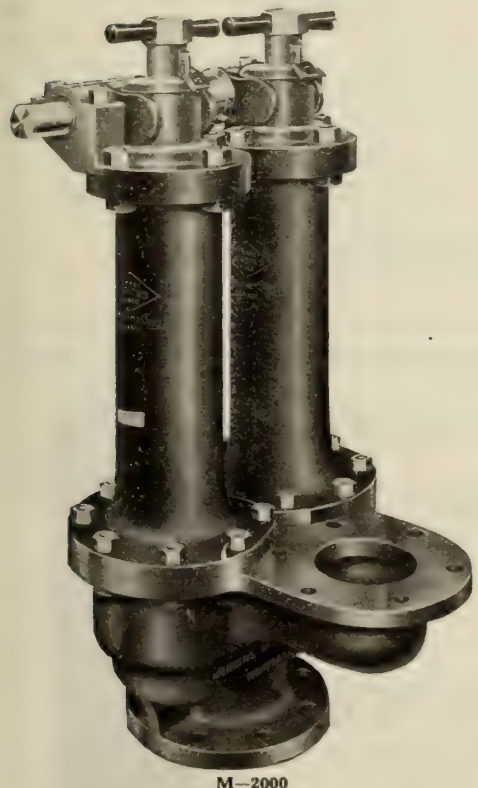
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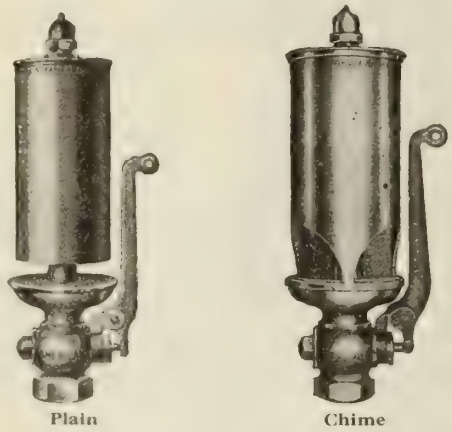
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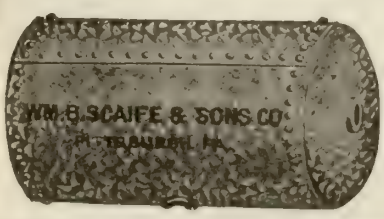
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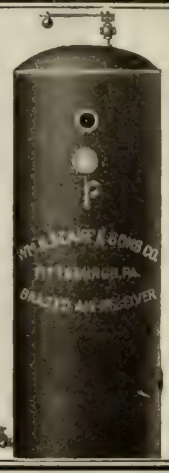


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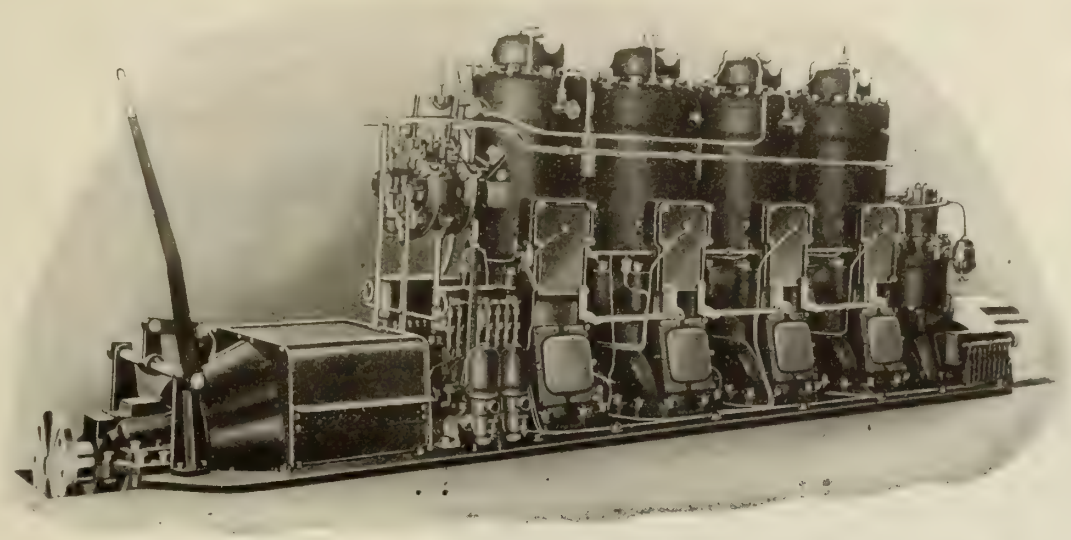
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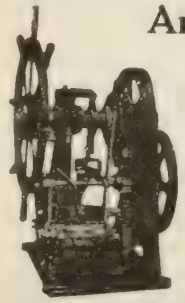
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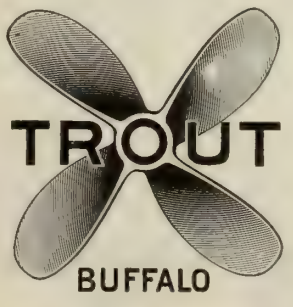
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THE Maritime Provinces did not enter Confederation very willingly and it may surprise people in other parts of the Dominion to learn that at the present time the people of New Brunswick and Nova Scotia are not altogether pleased with the results of the bargain. There is a distinct feeling among them that the advantages of Confederation have gone to the other Provinces. In the course of an article in the July issue of MACLEAN'S MAGAZINE, Thomas M. Fraser explains why this feeling has grown and the basis for it.

This article was written for the purpose of letting the other provinces know that the feeling exists but it will be of intense interest to people in the Maritimes. Be sure to read it—"The Spirit of the Maritimes."

"The Land of National Leaders"

An article on the political aspect of the Eastern Provinces and the achievements of their leading statesmen.

"Guarding Our Coast Line"

An extremely interesting description of the measures that were taken to patrol and guard the Atlantic seaboard during the war.

Bonar Law, the man from the Maritimes, who has been the able lieutenant of Lloyd George at all crises in Great Britain, appears on the cover in a handsome three-color reproduction.

Other Big Features of the Number

"With the Snowball Brigade"

By Captain Louis Keene

Just back from Siberia—Captain Keene tells some sensational and intensely gripping things about conditions in that country which the Canadian forces are helping to stabilize. It is a record of international complications, strange atrocities and almost unbelievable living conditions.

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The fourth instalment of his remarkable story of the five years he spent in the north for the Canadian Government, appearing exclusively in MACLEAN'S.

Three Magnificent Stories

The best fiction obtainable is found in this issue: "Owners Up," a race horse story by W. A. Fraser; "His Majesty's Well Beloved," by Baroness Orczy; Bunkered," by Allen C. Shore.

The Review of Reviews

Here are a few of the articles in this splendid department chosen as the best published during the past month in all magazines:

Finding Husbands For Three Million Women.
Will England Become an Agricultural Country?
Germany Can be Prosperous Under the Peace Terms.
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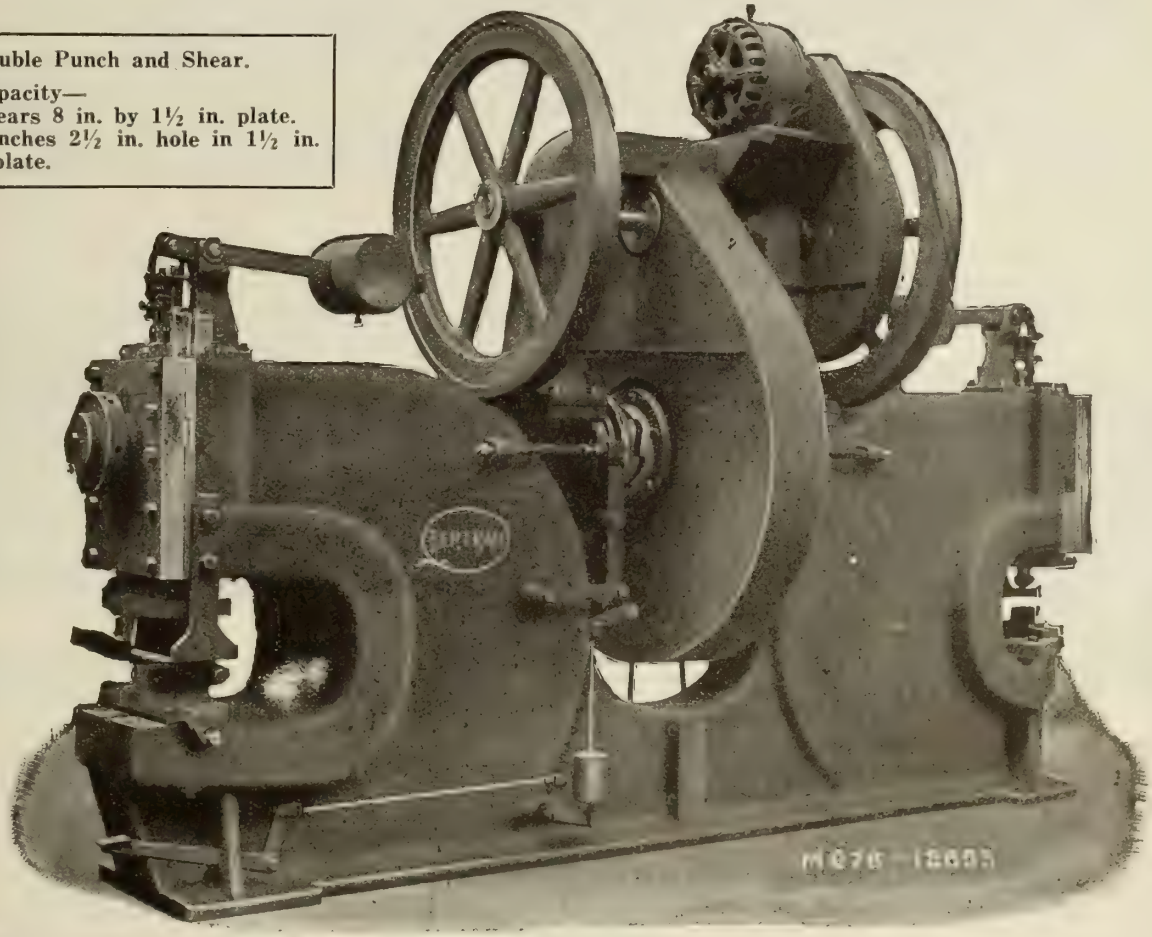
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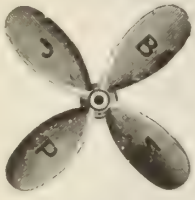
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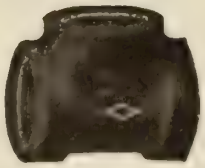
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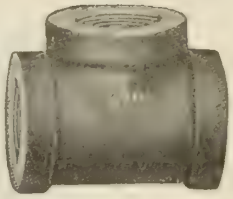
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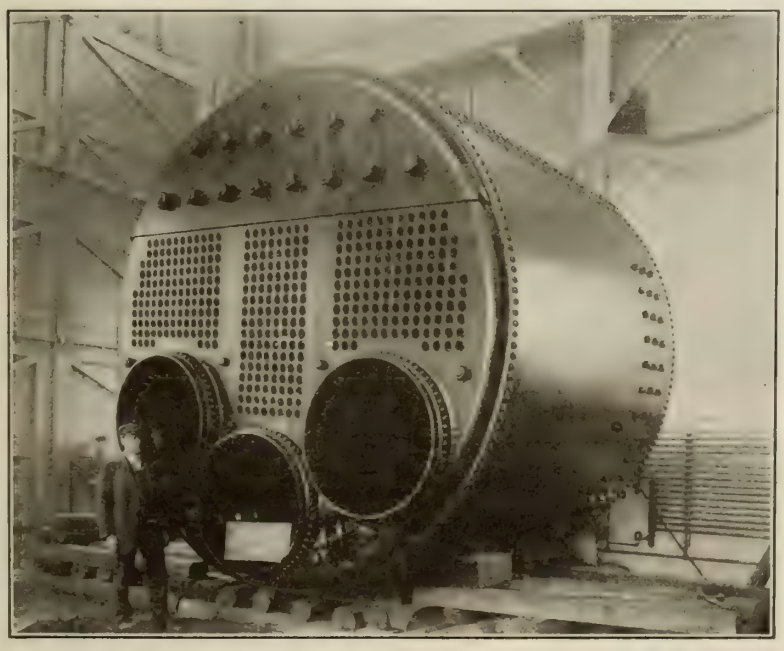
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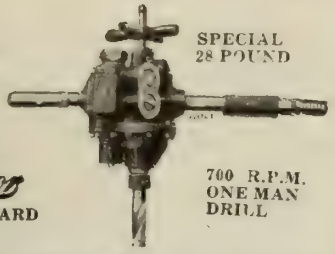
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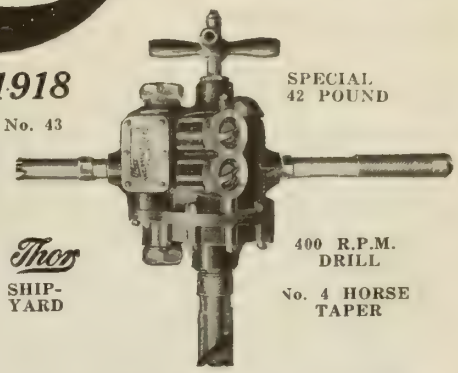
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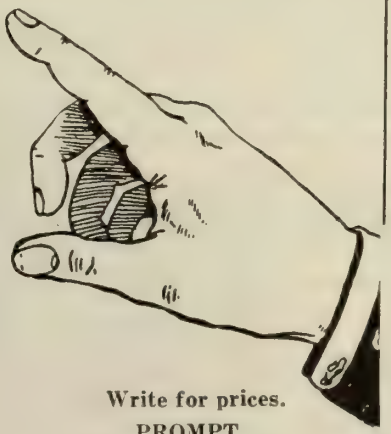
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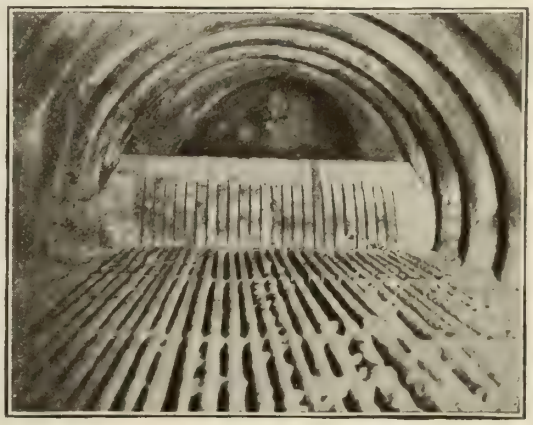


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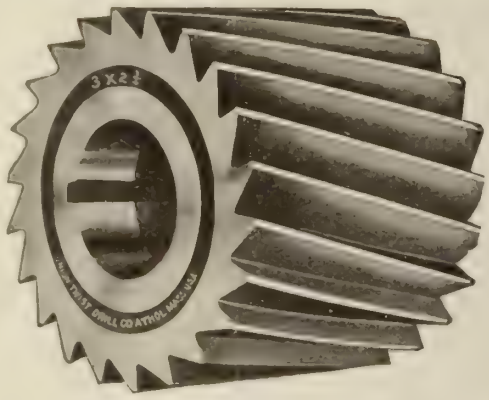
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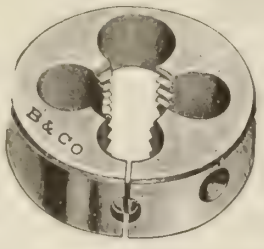


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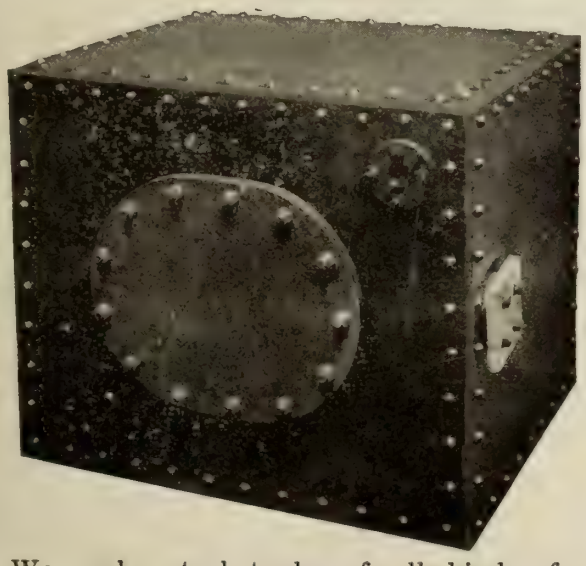
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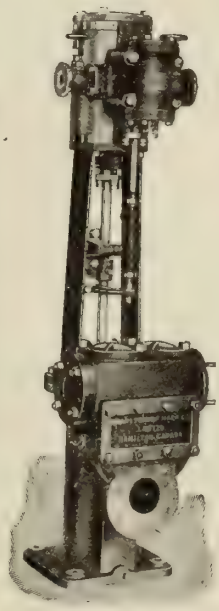


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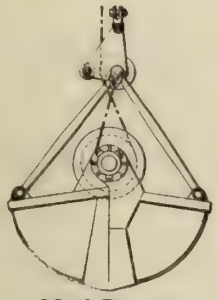
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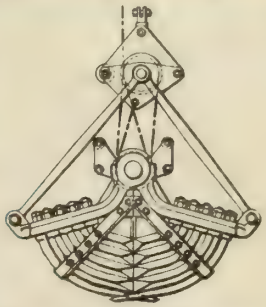


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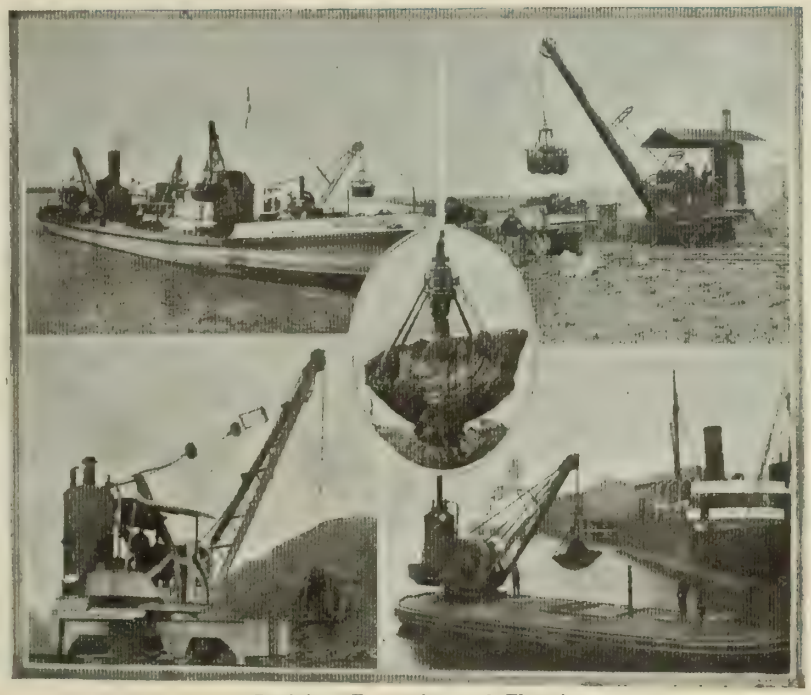
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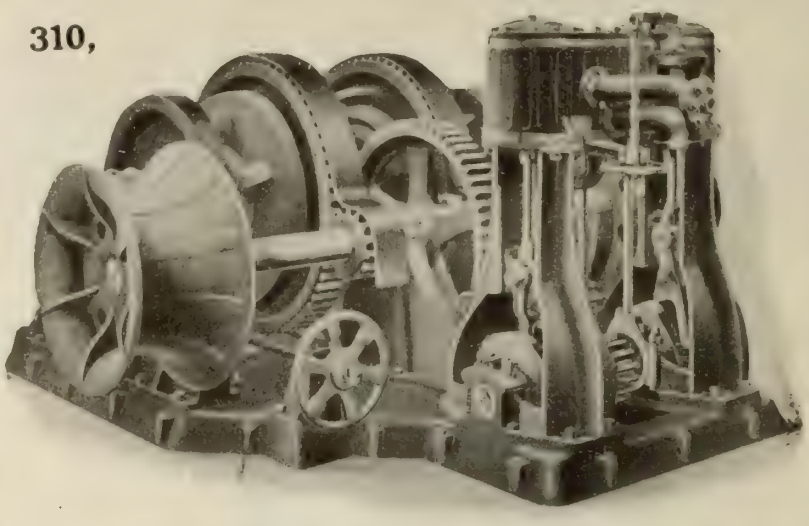
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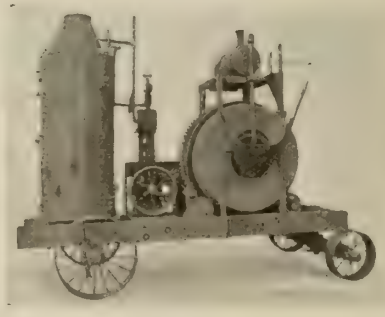
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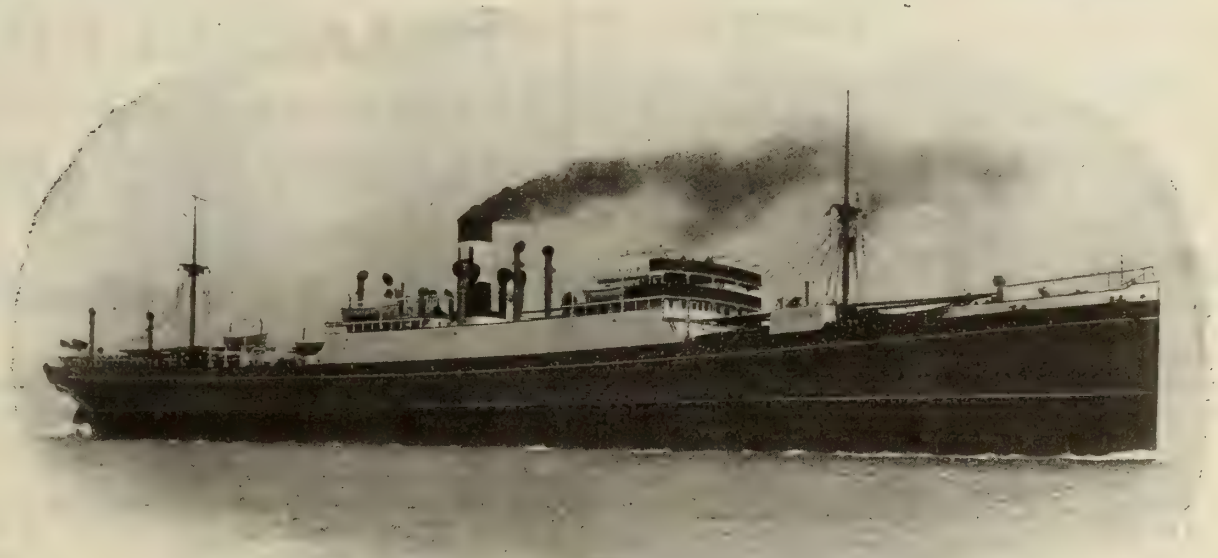
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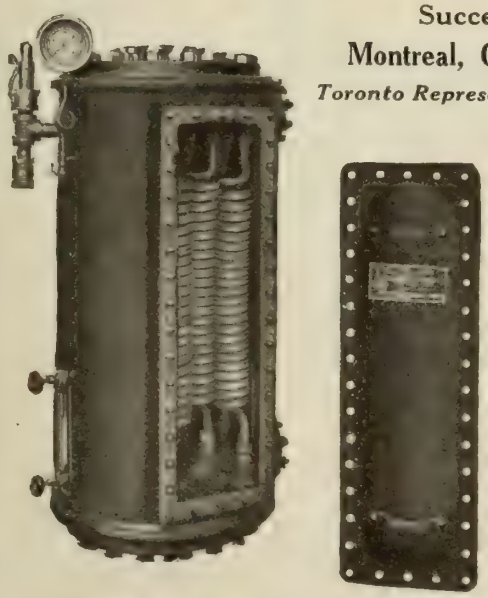
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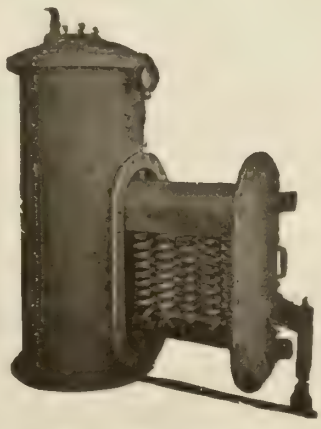
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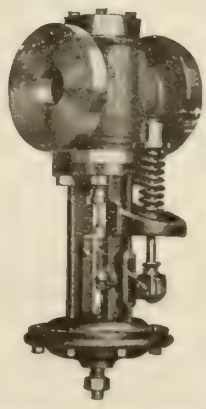
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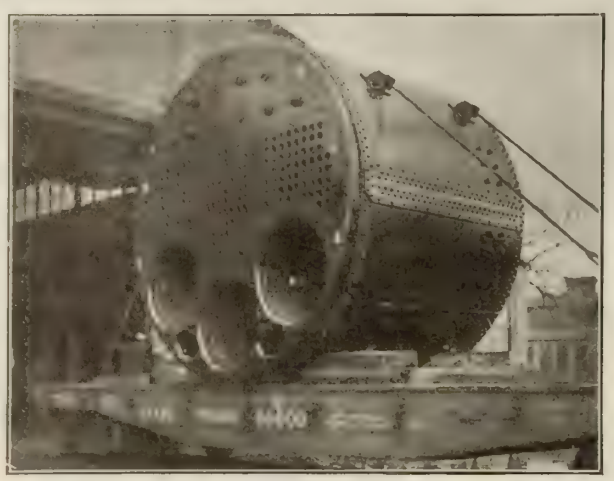
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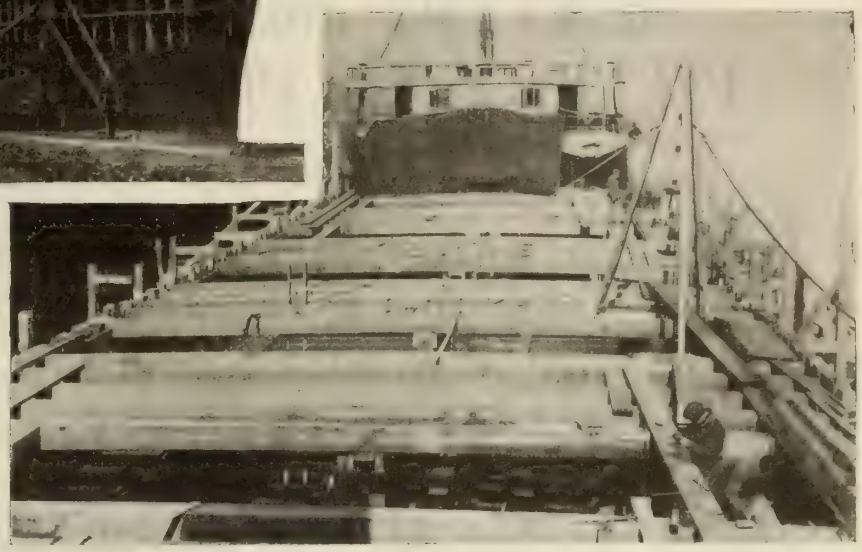
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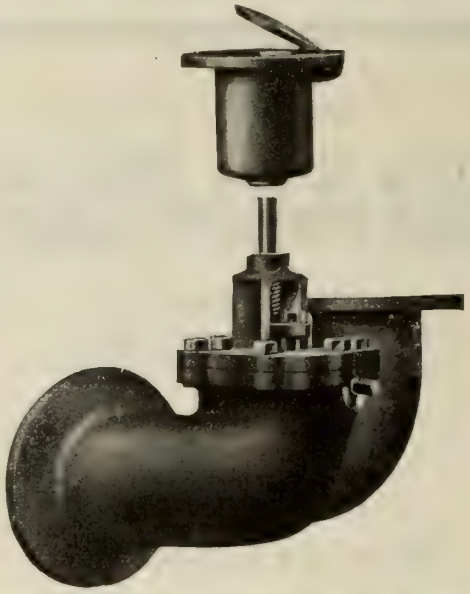
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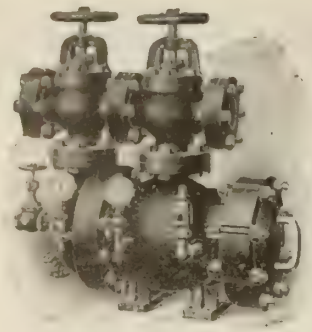
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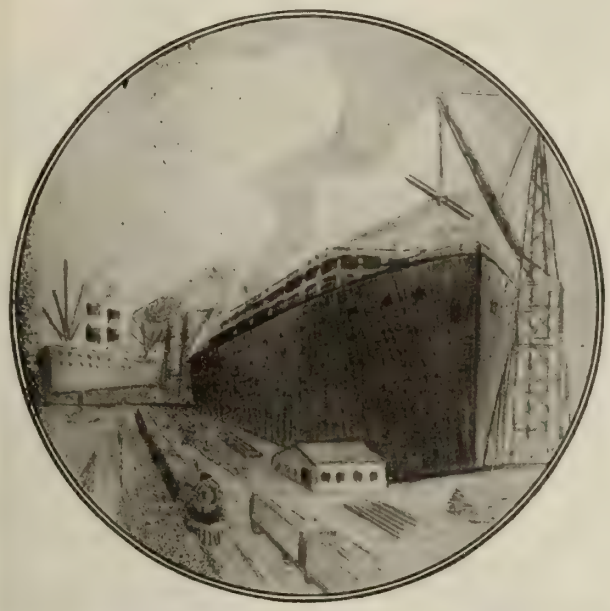
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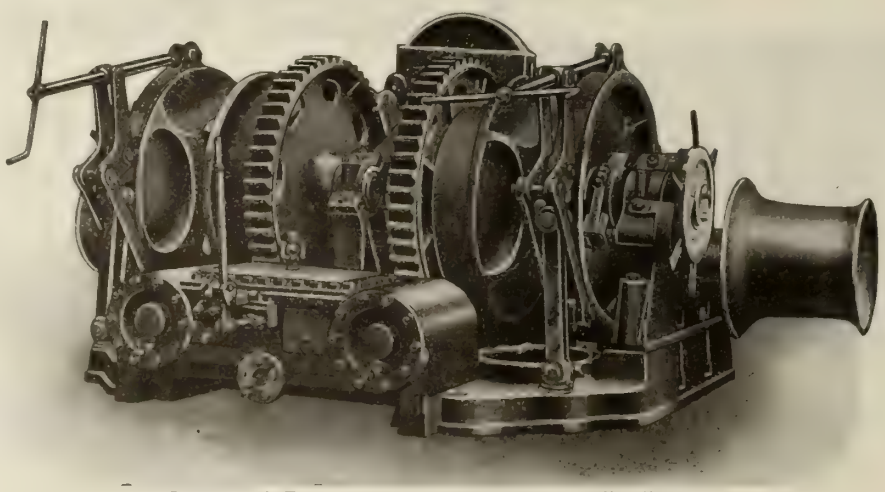
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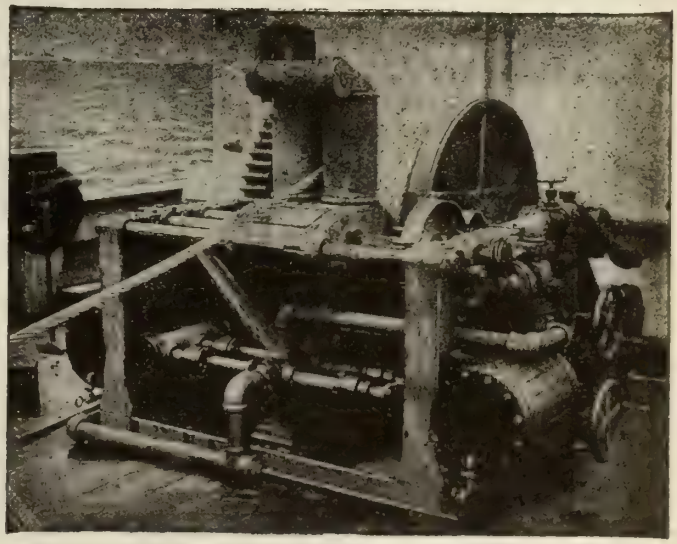
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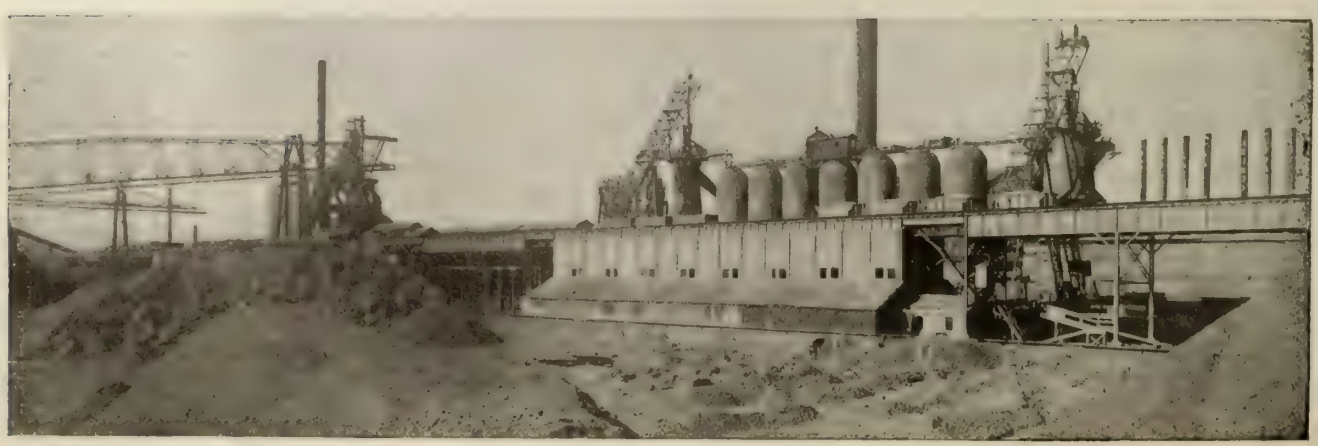
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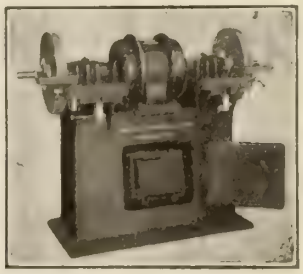
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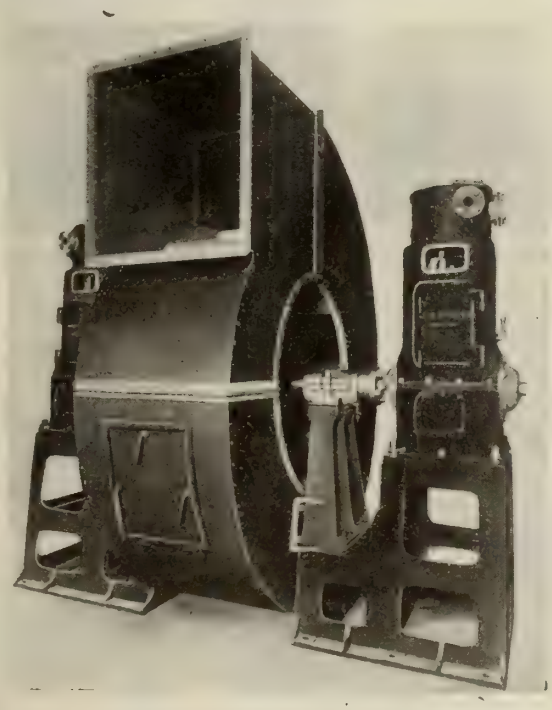
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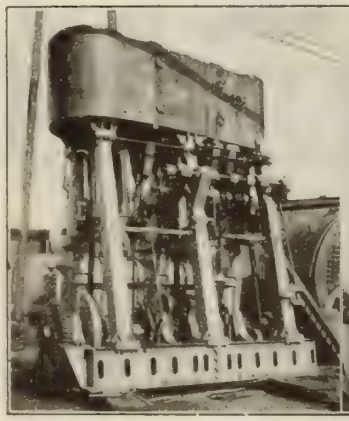
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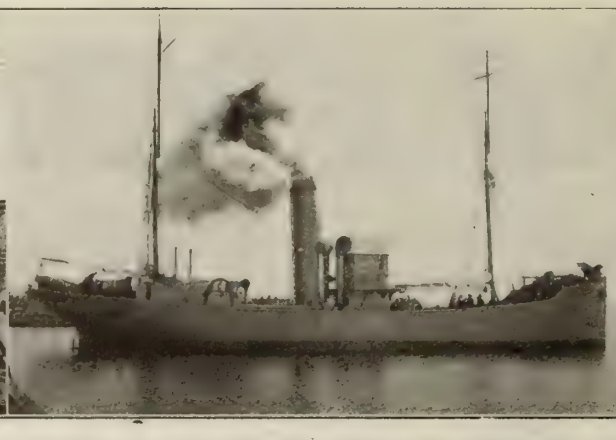
Breadth Moulded 52 ft.

Depth Moulded 28 ft. 9 in.

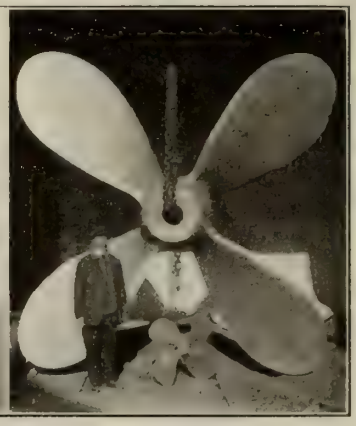
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MARINE ENGINEERING
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Volume IX. TORONTO, AUGUST, 1919 Number 8

Italian Turbine Driven Marine Auxiliaries

An Interesting Installation of Auxiliary Machinery as Fitted by Franco Tosi Company, of Legnano, Italy, is Described in the "Engineer"—For Vessels of 10,000 to 12,000 Tons

AS an indication of the reliability of modern steam turbines and the trust which engineers now put in this class of machinery, the equipments which the Franco Tosi Company, of Legnano, Italy, is manufacturing for merchant steamers are of topical interest. These installations, several of which have already been put in commission, are suitable for vessels of from 10,000 to 12,000 tons displacement, and their chief peculiarity lies in the adoption of turbine drives for the principal auxiliaries. In the illustrations which accompany this article no attempt has been made to show the general arrangement of the machinery in the ship, as the disposal of the various units must be made to suit the peculiarities of the vessel, but all the essential items are shown individually.

The main propelling machinery comprises a pair of reaction turbines, connected by means of cut gearing with a single propeller. Two sizes have, so far, been produced. One is of from 2,100 to 3,000 horse-power, at a propeller speed of 80 revolutions per minute, while the other develops 2,400 to 3,400 horse-power at 65 revolutions per minute.

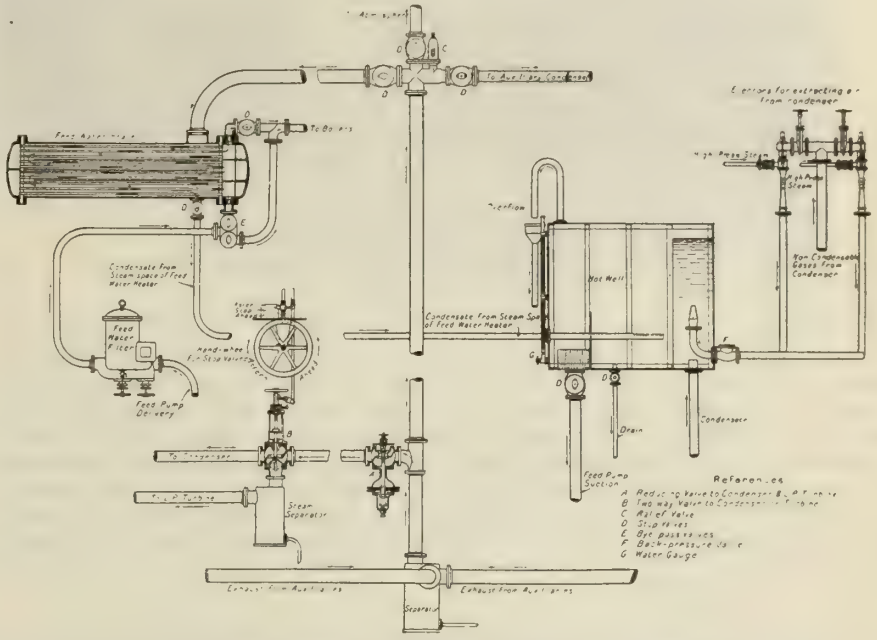


FIG. 1—ARRANGEMENT OF FEED HEATING APPARATUS

The engravings, Figs. 4 and 5, represent one of the larger sets. It will be noticed that at the forward end the two turbines are tied together by means of a good solid base, while aft they are attached to the main gear box. The high-pressure turbine is to port, while the low-pressure machine, with which is incorporated the astern turbine, is on the starboard side. The condenser, it will be seen, is arranged directly beneath the low-pressure turbine, to which it is rigidly attached, while the weight is carried by means of stools with spring cushions. The rotors of the turbines are of exceptionally rigid construction, and the blading is fixed in the grooves in the rotor by means of multiple serrations, which minimize the likelihood of the blades coming out of place. The glands, where the shafts come through the casings, are packed by means of graphite rings, which can be easily dismantled. Both the turbines run at 2,500 revolutions per minute. Arrangements are made for admitting high-pressure steam to the low-pressure turbine, for going ahead, in cases of necessity.

The speed reduction gear is of the double-reduction type, with single helical

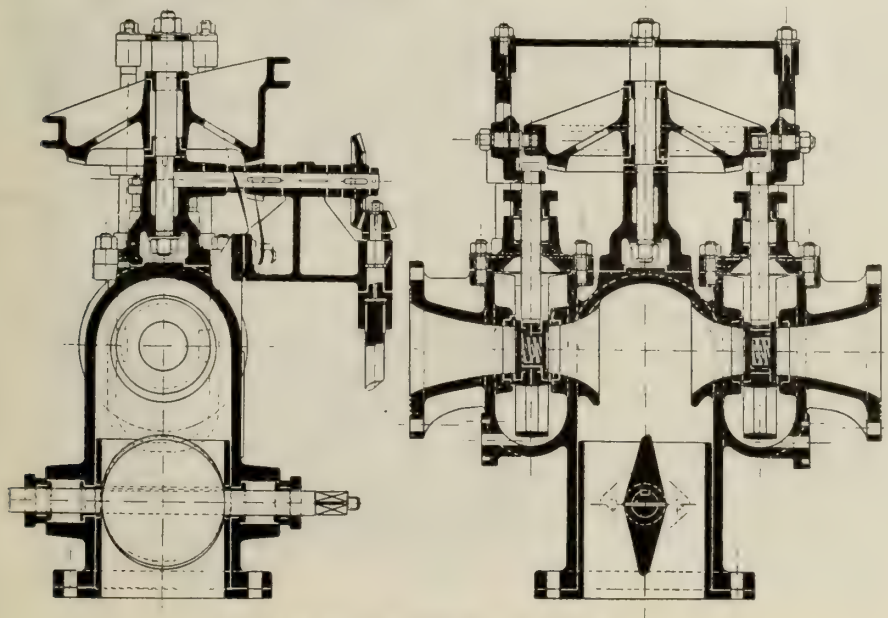


FIG. 2—MAIN MANOEUVRING VALVES.

cut teeth. End thrust on the gear shafts is, however, eliminated by the use of pinions and wheels in pairs, with the teeth cut in opposite directions. It will be noticed that the propeller shaft is placed considerably below the level of the turbine spindles, with the result that the whole set is made as compact as possible and the shaft is brought very low down in the vessel and the maximum immersion of the propeller obtained. The thrust box is separate from the gear casing, but is arranged immediately aft of it.

The condenser is of the modern surface-condensing type, with a triangular carcase, so formed as to have a cross-sectional area proportionate to the volume of steam passing at any point, and arranged to cool the incondensable gases as far as possible. Ordinary air pumps have been dispensed with, and in their place there is a pair of steam ejectors. These ejectors are shown in the line drawing, Fig. 1, and either one of them is of sufficient capacity to maintain a good vacuum with the turbines working at full load. The ejectors are naturally less bulky than air pumps, and as the heat of the steam which they consume is saved, as described later, the high steam consumption generally associated with this class of apparatus is probably offset by the saving in weight and space. The condensate is extracted from the bottom of the condenser by means of a centrifugal pump combined with the circulating pump.

The circulating pump is driven by a small turbine giving from 40 to 50 horse-power when running at 5,500 revolutions per minute. A gear box reduces this speed to 500 revolutions per minute at the shaft of the pump. The pump is of the balanced inlet type, and is capable of an output of 250 litres per second against a head of 6 m. (3,500 gallons per minute against 20 ft. head). On the same shaft there is an oil pump for the general lubrication, while a set of helical gears drives a vertical shaft for the pump taking the condensate from the condenser. In some cases, however, the condensate pump is driven by a separate small turbine, running at 6,000 revolutions per minute, with a gear box reducing the speed to 2,000 revolutions per minute. In any case a spare pump is provided for the purpose, while there is a stand-by oil pump, and circulating water for the condenser can be obtained from the ballast pumps if necessary.

The builders have adopted the water-tube type of boiler with comparatively small tubes, and in this connection claim that with the elimination of oil from the feed-water, due to the employment of steam turbines in place of reciprocating engines, water-tube boilers are quite suitable for the merchant service. They also point out that by taking proper precautions to reduce the corrosion of condenser tubes, sea water can be largely kept out of the feed-water system. The



FIG. 3—FORCED DRAUGHT FAN

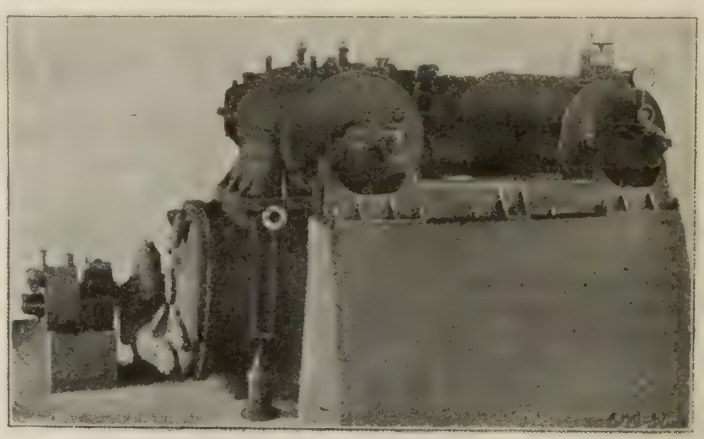


FIG. 4—GENERAL VIEW OF TURBINES AND CONDENSER

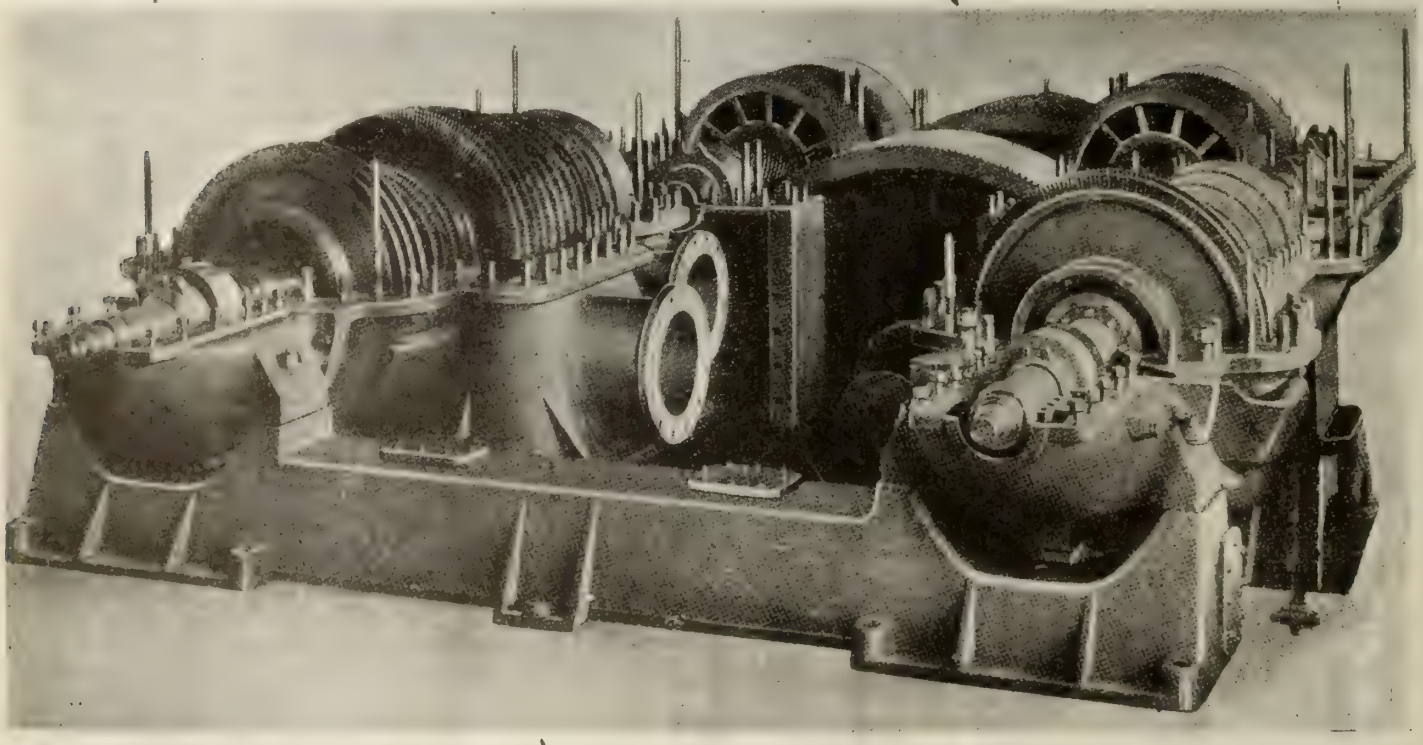


FIG. 5—TURBINES AND GEARINGS, WITH COVERS REMOVED

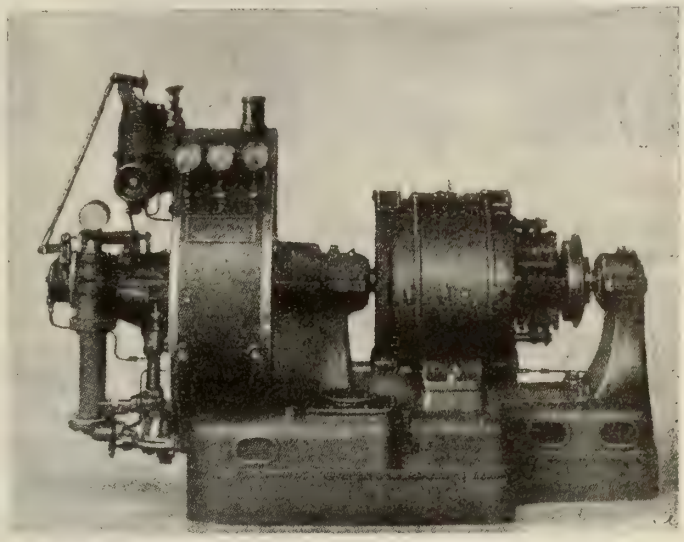
boilers have a generous amount of water space, and it is said that fifteen minutes would elapse before the water level was reduced to a dangerous extent in the event of inattention to the feed valves. The feed is, however, regulated automatically. The boiler casings are made of a double thickness of sheet metal, with an intervening air space, through which the air necessary for combustion passes on its way to the ash pit. In this way



FIG. 6—MANOEUVRING VALVES

the heat radiated from the boiler is not only conserved, but the temperature of the stokehold is made much more comfortable for the men. The boilers are worked under a low-pressure forced draught, for which purpose turbine-driven fans are installed. One of these fans is shown in Fig. 3, from which it will be seen that the machine is of the vertical type, with a downward inlet and a free discharge. The turbine is of 20 brake horse-power, and runs at 5,500 revolutions per minute, while the speed is reduced to 800 revolutions per minute at the fan shaft. The output at this speed is 8 cubic metres per second against a head of 80 mm. of water (17,000 cubic feet per minute against 3 in. water gauge). The fans are arranged to suck the air out of the engine-room and thus improve its ventilation.

Feed-water is supplied to the boilers by a pair of centrifugal pumps, either of which is sufficiently powerful to feed all the boilers. The pumps are direct connected with 20 brake horse-power turbines running at 6,000 revolutions per minute, and are each capable of delivering 7 litres of water per second against a head of 200 m. (5,500 gallons per hour against 280 lb. per square inch). The pump impellers are of bronze and an automatic pressure regulator is provided, which, it is said, has been proved to be capable of controlling the pump without any attention on the part of the engineer.

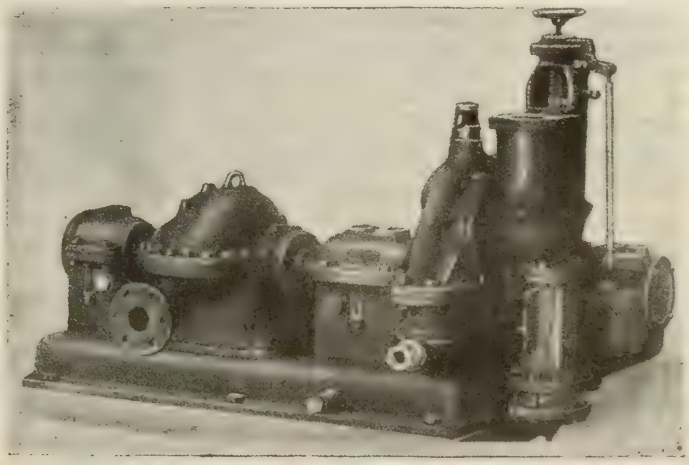


ELECTRIC LIGHTING SET

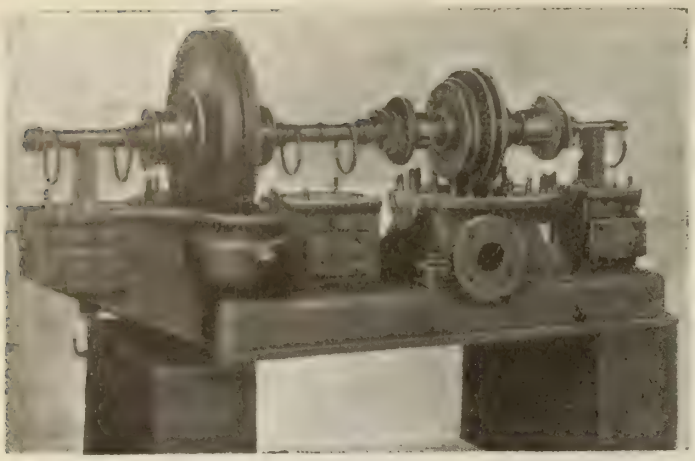
The novel form of manoeuvring valve adopted is illustrated by the sectional drawings—Fig. 2. It will be noticed that the Ferranti type of valve is employed, and that when it is opened a sleeve takes the place of the valve disc and prevents losses due to eddies round the seating. Steam for going ahead is taken from one valve, while the valve on the opposite side of the main casting supplies steam to the astern turbine. The valves are operated by means of a peculiar cam-like plate, which can be seen plainly in Fig. 6. The cam plate is so shaped that either valve can be fully opened or closed while the opposite valve remains shut. Both valves can be closed at the same time, but they cannot possibly be opened together. Below the manoeuvring valves there is an emergency valve—see Fig. 2—which is tripped by an oil servomotor in the event of the turbines running away.

On reference to Fig. 6 it will be noticed that there is a smaller valve operated in connection with the manoeuvring valves. This small valve controls the exhaust from the auxiliaries already mentioned, and appears marked B in the line drawing—Fig. 1. This drawing is a diagrammatic representation of the arrangements employed to conserve the heat value of the steam used in the auxiliaries, by absorbing this heat in the feed-water on its way to the boilers.

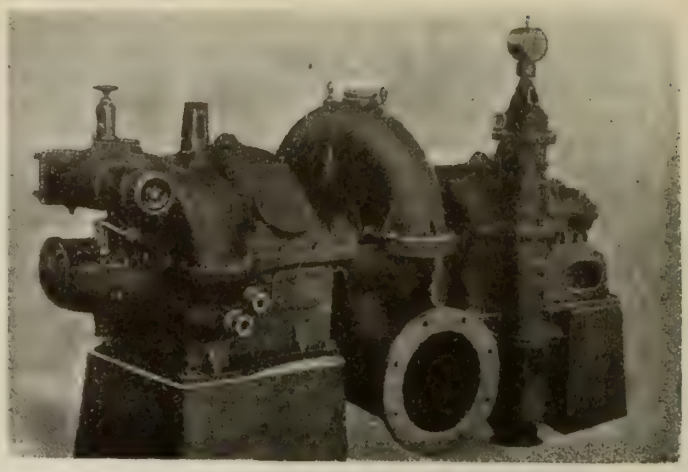
The several exhausts which are concerned comprise those from the circulating, feed and condensate pumps, the fans and the lighting dynamo, if one is installed. All these supplies of low-pressure steam are collected together at the separator, shown at the bottom of the diagram. In normal running the steam passes up the central pipe and is utilized in a tubular heater to raise the temperature of the feed-water. In view of the fact that the steam, having come only from turbine sets, is entirely free of oil,



MAIN FEED PUMPS



CIRCULATING AND OIL PUMP



FEED PUMP WITH COVERS OFF

the condensate from the feed heater is drained into the hot well, and the whole of its heat thus saved. In the event of the quantity of exhaust from the auxiliaries being so great that the feed heater cannot utilize it all, a proportion finds its way past the valve A, which opens at a pressure of about 4½ lb. per square inch. When the main propelling machinery is running the steam passed by the valve A goes through the valve B to the low-pressure turbine, and there does useful work. If, however, that turbine is going astern the valve B is automatically moved, in the process of working the manoeuvring valve, so that the surplus auxiliary exhaust is led direct to the main condenser. In order that the auxiliaries may be run when the main turbines are standing, connections are arranged for exhausting to the atmosphere or working in conjunction with an auxiliary condenser.

Another important source of steam, for heating purposes, is the set of ejectors which extract the non-condensable gases from the main condenser. The ejectors are shown to the right of the drawing, and it will be seen that they discharge into the hot well, where the steam is condensed in a compartment supplied with the comparatively cold return water from the main condenser. The feed pump, it will be noticed, takes the water from the hot well, after it has been mixed with all the available hot returns, and delivers, through a filter, to the feed heater. A by-pass is so arranged that the filter can be put out of action for cleaning, and the supply of water to the boilers maintained.

The very complete manner in which not only the heat of the auxiliary exhausts, but also the soft water resulting from their condensation, are saved and quickly returned to the boilers, must result in these sets of machinery having a high thermal efficiency, and although we have no figures before us to show the actual results of working, it will readily be conceded that the designers deserve credit for having produced a simple, yet effective, general arrangement requiring very little manipulation on the part of the engine-room staff.

THE AQUITANIA

After having steamed nearly a quarter of a million miles, and carried nearly a quarter of a million troops on war service, the Cunard liner "Aquitania" left Southampton on Saturday evening for New York, via Brest, on her last trip prior to being overhauled and reconditioned for peace service.

The number of saloon passengers, civilian and military, is 1,100, a record in first-class passenger traffic. In addition, she has nearly 5,000 American troops. Included in the passenger list are Sir George Perley (High Commissioner for Canada) and Lady Perley, Dr. T. A. le Breton (Argentine Ambassador at Washington), Sir Harry McGowen, Hon. B. Crowell (United States Assistant Secretary for War), Major-General Squires (Chief of the United States Air Service), Mrs. Ella Wheeler Wilcox, and Colonel F. F. Longley, Officer Commanding the United States troops on board.

It was in the first days of August, 1914, that the "Aquitania" was taken over by the British Government, and in less than a week was transformed into an armed merchant cruiser. About 3,000 men were employed on the task of stripping her luxurious passenger accommodation, and over 1,200 wagons of fittings were taken into store. Subsequently she was fitted out as an Admiralty transport, and made several voyages to the Dardanelles, carrying in all about 80,000 troops, but it was as a hospital ship that she performed, probably, her most valuable work. Her vast size and up-to-date design facilitated the transformation into hospital wards of her lofty public rooms, and in the course of her commission she carried about 25,000 wounded soldiers.

During the critical days of the spring of last year she was speedily refitted as a transport, and in nine voyages carried over 60,000 American troops to Europe. Since the Armistice she has been engaged in the repatriation of American and Canadian soldiers, carrying a total of about 50,000. For some months she has carried a limited number of civilian passengers.

It is interesting to recall that on her maiden trip she crossed the Atlantic at an average speed of over 23 knots, and this speed was subsequently exceeded on several occasions.

AIR SCREEN FOR FURNACE WORKERS

An account was recently given in a German technical paper of the latest methods employed in Germany for screening furnaces. Workers required to examine the glowing material at frequent intervals suffered a great deal from the excessive heat radiated, and various devices have been tried to minimize the ill effects. For example, hollow water-cooled furnace doors have been tried, but obviously they afforded protection only while closed. Again, devices have been installed for drawing off the hot air in front of furnaces by centrifugal exhausters placed in front of the furnace opening. An objection to these is that workers are subjected to great variations in temperature prejudicial to health. According to the article quoted, the most effective device is to fix immediately behind the furnace door a narrow, oblong nozzle, through which cold air is blown upward, thus interposing a screen and relatively cool air between door and furnace. This arrangement is to give adequate protection to the worker, and has the incidental advantage when the doors of the furnace are opened, the escape of flame is checked.—Engineering and Industrial Management, London.

Readers who have followed the articles contributed for some time past by Captain George S. Laing, on "Seamanship and Navigation," will be interested to learn that "The Skipper" is going to devote his time to lecturing under the auspices of the Navy League of Canada. This will necessitate him discontinuing this series of articles, and our September issue will contain the last of these. Captain Laing is taking up a useful work and we feel sure that he will interest many young fellows in the question of taking up the life of a sailor now that they can sail under their own Canadian flag.

The Cross Drum Type Heine Water Tube Boiler

Description of the Boiler as Fitted in the Ships of the United States Emergency Fleet and Other Vessels—The Cross Drum Type Has Proved Very Satisfactory in Service

MARINE boilers of two types have been built by the Heine Safety Boiler Company in their plants at St. Louis, Mo., and Phoenixville, Pa. —the "longitudinal drum" type and the "cross drum" type.

The former is built on the lines of their well-known Heine water tube boiler and the earlier ships were fitted with these, but the later and by far the greater number of ships have received boilers of the "cross drum" type, which has shown itself so superior for the peculiar and exacting marine service that it is now the Standard Heine Marine Water Tube Boiler.

The boiler proper consists essentially of three pressure elements joined together by a multiplicity of tubes. These elements are two flat rectangular box headers and a cylindrical steam drum, as shown in Fig. 1.

The main bank of tubes extends between and connects the two box headers, which are set with the flat surfaces a certain distance apart. The connecting tubes are all of the same length, straight and parallel with each other, and when this part of the boiler is set in operating position, are inclined at an angle of sixteen degrees to the horizontal.

Above the front box header and slightly to the rear of it is placed the steam drum, which is connected to the front header by a rof of nearly vertical short tubes or nipples and to the rear header by a row of longer tubes, which are horizontal when the boiler is set.

The boiler proper, made of drum, box headers and tubes, is supported by a strong, rigid, steel structure resting on and secured to proper foundations in the vessel—partly shown in Fig. 3.

The steam drum is cylindrical and varies in the several sizes of boilers from 36 in. to 48 in. in diameter. It consists of a single plate steel shell of a thickness corresponding to the pressure requirements, rolled to a true circle, fitted with a double-riveted, double butt-strapped longitudinal riveted seam and at the ends with flanged and dished steel heads which require no braces. In one of these heads is arranged a flanged-in manhole for access to the interior of the steam drum.

Where the tubes enter and are secured to the shell of the drum, reinforcing plates are fitted. On top of the drum are fitted heavy pressed steel saddles for attaching the main stop valve, auxiliary stop valve and safety valve.

To the front side of the drum shell are riveted pressed steel flanges for attaching main and auxiliary feed check valves, surface blow valve, two water gauge glasses and three test cocks.

Inside the drum, properly secured to shell and firmly braced in position, is fitted a steel deflection plate. This plate is of sufficient length to cover the ends of the horizontal tubes and extends below the water level, its purpose being to act as a separator for the mixture of steam and water entering the drum through the horizontal tubes. The water thrown violently against this plate runs downward into the body of water below and the steam passes along and around the ends of the plate and to the dry pipe above.

An internal feed pipe is fitted between the feed check valves. This is perforated in order to distribute the entering feed water uniformly through the water already in drum to avoid producing undue strains. The same pipe is connected in both checks.

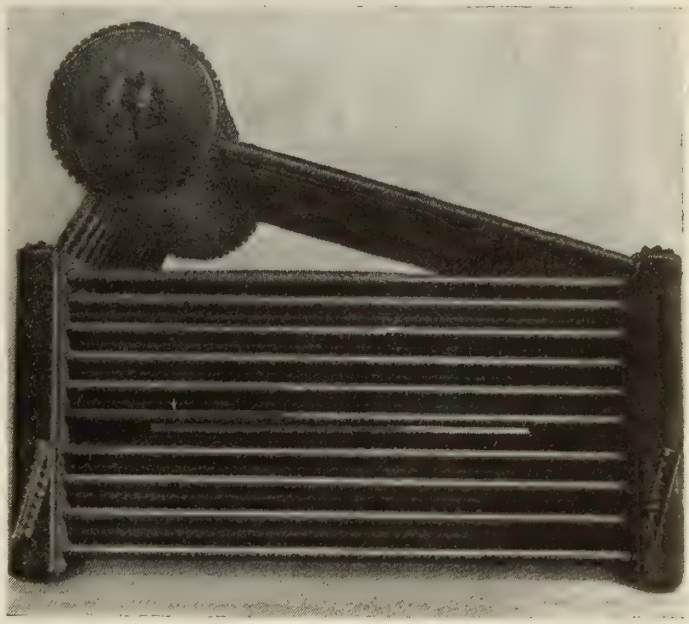


FIGURE 1

A scum pan of the usual "dish" type with its cover plate slightly raised to produce an efficient "skimmer" effect, is located at the centre of the drum, exactly on the water line, and piped to the surface blow outlet on the front of the drum shell.

Surge plates are fitted to check the rush of water along the drum as the vessel rolls in a seaway. These plates, together with the deflection plate, make a substantial structure for supporting and securing the various fittings within the drum.

The main steam outlet is provided with a dry pipe of ample area. This pipe is fitted as near the top of the drum as practicable and has slots cut through its upper side, the area through these slots exceeding the area through the outlet opening. Calorimeter tests show that the Heine marine boiler thus fitted delivers steam containing less than three-quarters of one per cent. of moisture.

Zinc slabs are also fitted in the drum of the Heine marine boiler. The Navy standard of three-quarters of a square foot of exposed zinc plate is provided for each one hundred square feet of heating surface of the boiler. These zinc plates are secured so as to give close metallic connection with the metal of the boiler and yet allow easy renewal. A pressed steel "basket" is also fitted to catch the disintegrated zinc.

Zinc plates are fitted to a marine boiler to act as a negative element of an electric couple which is formed when it and iron or steel are placed in a saline liquid. It is impossible to keep boiler water in the ocean service absolutely fresh, and if correctly fitted, zinc thus avoid pitting and deterioration of boiler plates from electrolytic action.

The box headers are constructed entirely of steel plate. Each consists of two flanged rectangular heads or end plates to which are riveted a wrapper plate in two pieces. These headers are so designed that all seams are readily accessible for inspection and recaulking without tearing away the boiler casing.

The end plates are flanged by hydraulic pressure at a single heat and are of the exact shape desired. The two wrapper plates, known as the tube sheet and the handhole sheet, have their edges turned over at the top and bottom

of the headers, lapped and riveted together with a single row of rivets; with caulking edges facing outward.

The flat surfaces of the tube and handhole sheets are truly parallel with a hand hole exactly opposite each tube hole, thus permitting access to the tube for cleaning and withdrawal of tube through the handhole when necessary.

The two flat surfaces of the box headers are stayed to resist internal pressure with large hollow steel stay bolts

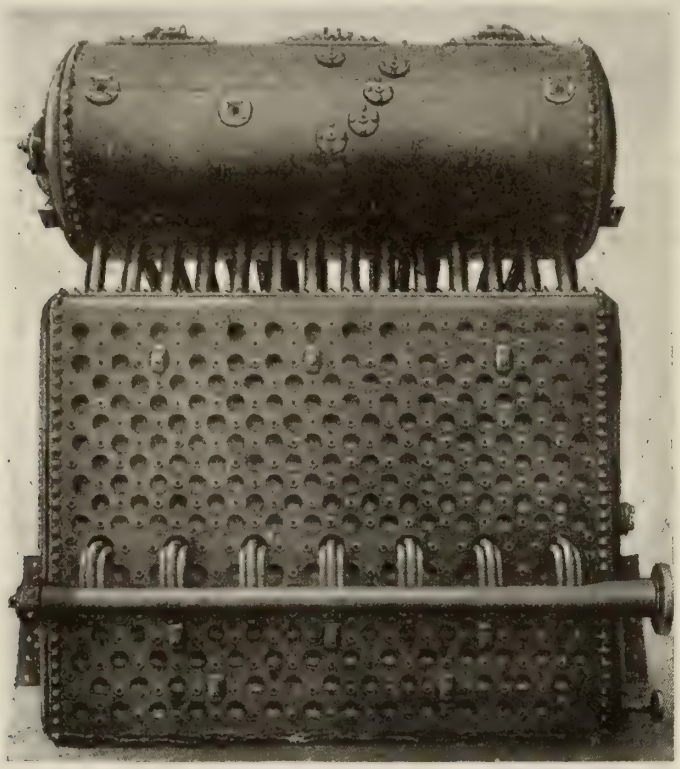


FIGURE 2

screwed through tapped holes in the plates, and with the projecting ends of stay bolts riveted over on the outside.

The stay bolts are threaded only at the ends, leaving a smooth cylindrical shank within the water space, thus offering no sharp edges or grooves to the corrosive effect of rust. Each stay bolt has a hole throughout its entire length of ample size to pass freely a ⅜ in. pipe lance for soot blowing.

Forged steel tee bar lugs (see Fig. 1), of heavy section. about 24 in. in length, are riveted to the outside of each flanged end plate of the headers for attachment to the supporting columns of the casing structure.

The flat bases of these tee bar lugs are caulked all around and the edges are ever accessible for inspection or recaulking without tearing out any part of the boiler support or setting.

Near the bottom of the front (lower) box header and on one side only (except in extremely wide boilers) is riveted a forged steel flange to which is bolted, with copper gasket in male and female joint, a heavily ribbed and flanged composition blow nozzle or extension pipe to the outer end of which is attached the bottom blow valve. An internal pipe leads to the extreme bottom of the box header and insures removal of sediment deposited therein.

The standard design of Heine marine water tube boiler has 3½ diameter tubes throughout.

For oil fuel only, they recommend the use of 2 in. tubes instead of 3½ in. tubes in the inclined bank between the headers, and build a special oil burning marine boiler so fitted.

They do not recommend the use of 2 in. tubes for coal fuel because of the great tendency of boilers fitted with small tubes, closely pitched, to "soot up," or become choked. Its superior steaming qualities are recognized. However, it is a fact that by the use of 2 in. tubes equal heating surface can be obtained in a boiler of much less height than is possible when larger tubes are employed.

They fit the Heine marine boiler with standard lap welded steel, charcoal iron, or seamless steel tubes, as the owner may prefer.

For low or medium superheat, Heine marine boilers are fitted with superheaters of the "waste heat" type placed in the base of the up-take, as near as possible to the exit of the gases from the boiler. For higher superheat the elements must be placed where they will be in contact with gases of higher temperature and are often fitted just below the middle baffle. the superheater elements passing through the 5 in. stay tubes between headers located outside the boiler (see Fig. 2). The right angle bend of the superheater tubes entering the top of the front pipe header is arranged at one end of the boiler only and permits of the tubes being more easily removed and replaced than if they were straight throughout.

Heine marine water tube boilers are built in accordance with the rules and regulations of the United States Board of Supervising Inspectors and are approved by Lloyd's Register of Shipping and the American Bureau of Shipping. When desired by the purchaser, either insurance company or purchaser is permitted free access to their works and given every opportunity for inspection and approval of plans and material entering into the construction of boilers

The setting of the Heine marine boiler consists primarily of a framework of rolled steel shapes so constructed that the four main columns, one each side of each box header, are tied together and braced, and thus secured rigidly against relative motion of any sort. These columns are secured at their bases to seatings prepared by the shipbuilder, the structure described forming a cradle within which, secured by the four tee bar lugs, the boiler proper is supported.

A steel plate casing is built upon this framework, entirely surrounding and covering the boiler and furnace with the exception of the drum. That portion beside the bank of inclined tubes is fitted in panels that may be readily removed for access to the brick lining, and a sectional bottom plate, that may be easily renewed, is fitted below.

The interior of the whole is lined with fire brick, non-conducting material or a combination of these. All parts are carefully fitted to prevent the ingress of undesirable air.

Where grates are furnished for coal fuel, a watertight pan is also fitted in the ashpit, but for oil burning installations the furnace space is made as large as possible. The casing about the furnace proper is lined with refractory walls 12 inches thick and above the lower baffle the lining is 7½ inches thick.

The furnace fronts for coal burning are fitted with balanced in-swinging doors above and below the grade. For oil burning the front is usually a steel plate with openings of suitable size cut to take burner castings.

When installed and ready for operation the Heine marine boiler is filled to the middle of the steam drum with water. The circulation is downward in the front box header and upward in the rear box header, upward and back in the lower majority of the bank of inclined tubes and downward and to the front in a few upper rows of inclined tubes; the steam parting from the water in the upper portion of the rear header and passing into the steam drum through the horizontal tubes as before described.

With this steam there is some quantity of free water which is separated and thrown down in the drum, the steam passing about the ends of the deflection plate to the dry pipe, the water passing down through the short tubes circulating water, it again passes through the lower inclined tubes.

Feed water entering the boiler issues

from the perforations in the internal feed pipe in jets, and is thus thoroughly mixed with the water in the drum before passing downward.

Should oil or impurities enter with the feed the scum formed may be removed by operating the surface blow with water level at middle of the glass. Sediment

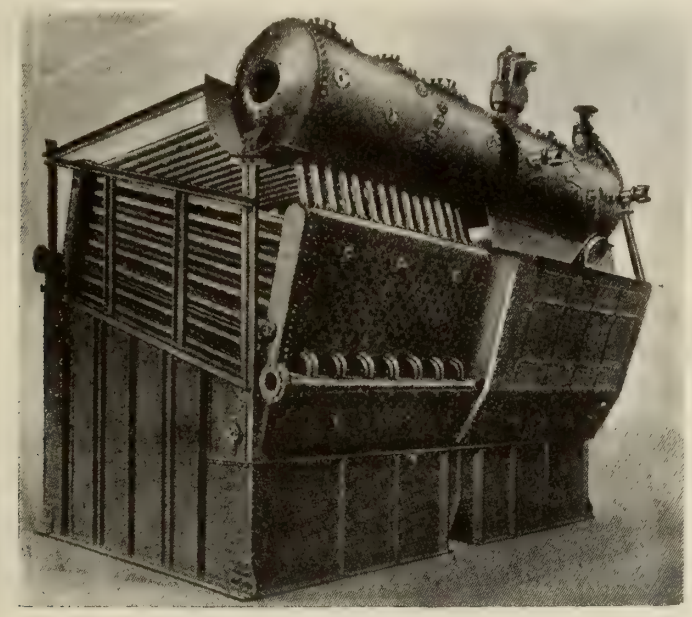


FIGURE 3

will be thrown down in front header, where the bottom blow is arranged to remove it.

Scale is removed from the tubes by using a hydraulic turbine cleaner, which, together with the necessary hoses, is provided with every boiler.

All boilers that are not too large are assembled complete at the manufacturer's shops before shipment. Usually, however, the clearance limitations of the railroads do not permit of complete assemblage and the drum and its connecting tubes must be fitted in place at the point of installation.

All parts are subjected to a hydraulic test of twice the safe working pressure before shipment. The work of fitting the drum at the ship's side or on board consists merely of inserting and expanding a few tubes.

The casings are assembled complete before shipment and knocked down after match-marking the various pieces so one cannot go wrong in re-erecting them at the shipyard.

When provisions at shipyard for handling the heavier pieces are inadequate and customer desires, the boilers will be shipped entirely knocked down. To assemble them aboard the ship will then be merely a job of rolling all tube ends, as the headers and drum will be complete in all respects.

"What a different world this would be if we used our eyes to see the best in others and encouraged each other by speaking of it."—The Three Partners.

GROWTH OF CANADIAN MERCANTILE MARINE

Vickers' Launch Another Vessel

ON Saturday last the S. S. "Canadian Miller" was released from her building berth and launched into the fitting-out basin at Canadian Vickers yard. The launch was successfully performed by Mrs. J. W. Norcross. There was no reception, but the ceremony was witnessed by a few guests, representatives of the Press, and the company's directors and officials.

The dimensions of the "Canadian Miller" are:

Length between perpendiculars, 400 feet; breadth, moulded, 52 feet; depth, moulded, 31 feet; draft, moulded, 25 feet.

She will have a deadweight cargo carrying capacity of approximately 8,500 tons, and speed of over 11 knots.

After her launch she was towed to the fitting-out wall of Canadian Vickers, where her engines and boilers will be installed, her moke stack, masts and derricks fitted, and her internal fittings completed. The vessel will be ready for service in from two to three weeks' time.

It is interesting to note that everything entering into the construction of this vessel, with the exception of the steel plate, anchors and chains, have been supplied and fabricated in Canada.

The berth at the fitting-out wall to which this vessel was towed was occupied but two days previously by her sister ship, the S. S. "Canadian Seigneur," which successfully ran her trials during the week and is now up harbor loading cargo for her maiden voyage.

The "Canadian Miller" will be the fifth vessel from Canadian Vickers yard, bringing the total deadweight cargo tonnage delivered by this company to the Canadian Government approximately 40,000 tons.

Three more vessels are under construction for the Canadian Government at Canadian Vickers yard.

Of the vessels already delivered to the Canadian Mercantile Marine a recent one is the "Canadian Ranger," which arrived in Montreal on July 31st, after her first voyage to England, and proceeded to sea on her second voyage exactly one week later.

The other vessels are the "Canadian Voyageur" and the "Canadian Pioneer," both of these having been in commission since the early part of the year carrying Canada's exports to other countries.

Records such as these, to say nothing of the contributions coming from other shipyards in the Dominion, fully justify the vigorous policy of the present Minister of Marine, the Hon. C. C. Ballantyne.

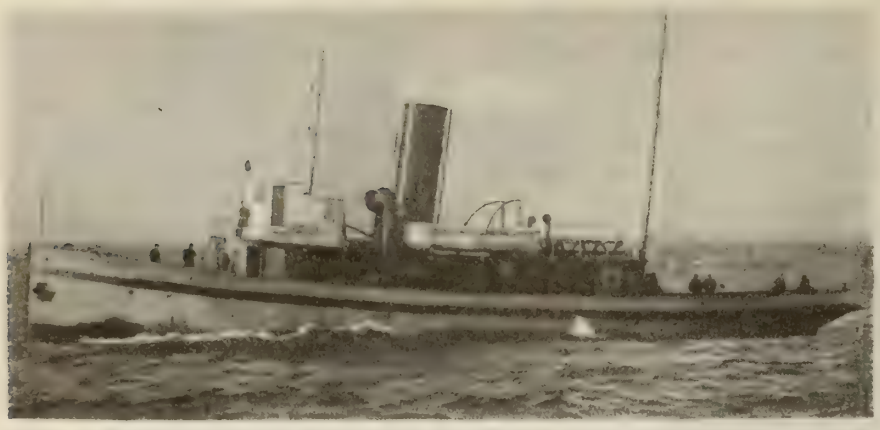
In watching this splendid ship move from her berth into the water one recalls the statement made by many British ministers in replying to "What has made Britain so Great?" and on every occasion the main reason given is that it is Britain's tremendous mercantile marine, which of itself brings a vast volume of trade to the country.

Canada has practically unlimited natural resources and is spending vast sums of money to develop them, but all her efforts in this direction are limited by the fact that to-day she only owns a very small percentage of the shipping using her ports.

Britain has become great largely by her possession of shipping and Canada's true line of national development is in the same direction.

Thanks to the realization of these points by the Hon. C. C. Ballantyne, Minister of Marine and Fisheries, Canada is now embarking on an extensive national shipbuilding programme with which she is determined to get back the control of her own overseas trade. This is her true national policy and she is quite able to carry it out successfully because to-day she can build ships equal with those of any country in the world.

The aluminates of lime, even when they contain such amounts of impurities as 10 per cent. silica and 3 per cent. iron oxide, constitute a material which the "Contract Record" claims to be a very valuable cementing medium when gauged with water. This particular value lies in the high early strengths which they develop. The greater the amount of the alumina present as an aluminate of lime, the greater will be the early strength. Under certain conditions of curing there is a marked increase of strength with age, but it does not extend over a very long period of time. It also appears that if the concrete is subjected to an excess of water during curing there will be a decrease in strength. Such amounts of moisture as are usually present in the air do not materially affect the strength. It appears, therefore, that these cements might be of considerable value for certain special uses, where the principal requisite would be quick hardening.



STEEL SEA-GOING TUG, 126 FEET LONG BY 26 FEET BEAM BY 16 FEET 5 INCHES. BUILT BY THE PORT ARTHUR SHIPBUILDING CO.

Montreal.—The monthly service to be provided between Montreal and Havre, France, by the Cie Canadienne-Francaise Transatlantique was inaugurated by the arrival of the steamer "Californie" in Montreal. She brought over 280 passengers, of whom 265 landed at Quebec. The vessel left again for Havre on the 7th inst. with freight and passengers. The second steamer, the "Hudson," is expected shortly.

Victoria.—The Canadian Pacific Railway Co. are building two new steamers for the Pacific service of 20,000 tons each. One has already been launched in England and will be called the "Empress of Canada," while the second one, which has just been laid down, will be named the "Empress of Australia."

LLOYD'S REGISTER SHIPBUILDING RETURNS

For Quarter Ended June 30, 1919

Warships are not included in these returns. Complete totals for Germany are not yet available, therefore no figures are shown for that country.

1.—MERCHANT VESSELS UNDER CONSTRUCTION

The returns compiled by Lloyd's Register of Shipping, which only take into account vessels of 100 tons and upwards the construction of which has actually been commenced, show that there were 782 merchant vessels of 2,524,050 tons gross under construction in the United Kingdom at the close of the quarter ended 30th June, 1919. The particulars of the vessels in question are as follows, similar details being given for the preceding quarter and for the 30th June, 1918, for the purpose of comparison:

Description	30th June, 1919 No.	30th June, 1919 Gross Ton.	31st March, 1919 No.	31st March, 1919 Gross Ton.	30th June, 1918 No.	30th June, 1918 Gross Ton.
Steam:						
Steel	711	2,492,276	603	2,220,816	382	1,807,518
Iron	..	.....	..	.....	..	.....
Wood and composite	8	2,293	5	1,663	1	120
Total	719	2,494,569	608	2,222,449	383	1,807,638
Sail:						
Steel	63	29,481	49	32,396	9	7,375
Iron	..	.....	..	.....	..	.....
Wood and composite	..	.....	..	.....	..	.....
Total	63	29,481	49	32,396	9	7,375
Total steam and sail...	782	*2,524,050	657	2,254,845	392	1,815,013

*The figures for steel include 28 ferro-concrete barges of 19,608 tons and 10 ferro-concrete motor vessels of 2,456 tons.

The tonnage now under construction in the United Kingdom is about 269 000 tons more than that which was in hand at the end of last quarter, and about 709,000 tons more than the tonnage building 12 months ago.

Of the merchant vessels being built in the United Kingdom at the end of June 609 of 2,033,319 tons are under the inspection of the surveyors of Lloyd's Register with a view to classification by this society.

2.—SIZE OF VESSELS UNDER CONSTRUCTION

Gross Tonnage—	Number Steam	Number Sail
*100 and under 500 tons	199	32
500 and under 1,000 tons	65	31
1,000 and under 2,000 tons	57	..
2,000 and under 3,000 tons	55	..
3,000 and under 4,000 tons	59	..
4,000 and under 5,000 tons	19	..
5,000 and under 6,000 tons	136	..
6,000 and under 8,000 tons	67	..
8,000 and under 10,000 tons	34	..
10,000 and under 12,000 tons	3	..
12,000 and under 15,000 tons	11	..
15,000 and under 20,000 tons	10	..
20,000 and under 25,000 tons	4	..
Total	719	63

*Vessels of less than 100 tons are not included in Lloyd's Register shipbuilding returns.

3.—WORK IN HAND IN PRINCIPAL DISTRICTS

The following table gives the total figures for vessels now under construction in some of the principal shipbuilding districts of the country, as compared with those for the preceding quarter and twelve months ago. Each district, of course, includes places in the neighborhood of the port after which it is named:

District	Description.	June, 1919 No.	June, 1919 Gr. Ton.	March, 1919 No.	March, 1919 Gr. Ton.	June, 1918 No.	June, 1918 Gr. Ton.
Barrow, Maryport, and Workington	Steam	6	28,865	7	27,095	4	11,380
	Sail	..	.....	6	4,200	..	.....
	Total	6	28,865	13	31,295	4	11,380
Belfast and Londonderry	Steam	40	318,100	39	312,675	29	230,350
	Sail	4	2,700	7	4,750	..	.....
	Total	44	320,800	46	317,425	29	230,350
Glasgow	Steam	153	541,797	110	444,588	74	329,668
	Sail	19	5,565	6	2,430	4	1,800
Clyde	Total	172	547,362	116	447,018	78	331,468
Greenock	Steam	77	343,305	63	304,105	51	283,010
	Sail	4	2,800	5	3,500	..	.....
	Total	81	346,105	68	307,605	51	283,010
Hartlepool	Steam	19	76,450	19	75,600	22	93,450
	Sail	..	.....	..	.....	..	.....
	Total	19	76,450	19	75,600	22	93,450
Hull	Steam	78	51,685	70	44,825	8	33,991
	Sail	9	1,574	..	.....	1	160
	Total	87	53,259	70	44,825	9	34,151
Liverpool	Steam	31	58,395	20	35,585	10	34,070
	Sail	..	.....	..	.....	1	1,250
	Total	31	58,395	20	35,585	11	35,320
Middlesbro' and Stockton and Whitby	Steam	45	161,920	40	147,020	29	137,330
	Sail	2	1,360	2	1,400	..	.....
	Total	47	163,280	42	148,420	29	137,330
Newcastle	Steam	100	498,294	91	433,932	62	383,275
	Sail	..	.....	..	.....	..	.....
	Total	100	498,294	91	433,932	62	383,275
Sunderland	Steam	63	269,018	59	259,467	54	242,050
	Sail	..	.....	..	.....	..	.....
	Total	63	269,018	59	259,467	54	242,050

4.—OTHER DETAILS

The following details concerning the shipbuilding work of the United Kingdom during the past three months may be added:

During Quarter ended 30th June, 1919.	Steam. No.	Steam. Gross Ton.	Sail. No.	Sail. Gross. Ton.
Vessels commenced	165	654,923	18	5,057
Vessels launched	181	514,249	25	13,651

5.—MERCHANT VESSELS UNDER CONSTRUCTION IN THE WORLD

(Allied and neutral countries)

Where Building.	Steam. No.	Gross Ton.	Sail. No.	Gross Ton.	Total. No.	Gross Ton.
United Kingdom	719	2,494,569	63	29,481	782	2,524,050
*Other countries	1,511	5,389,915	233	328,068	1,744	5,493,717
Total for the world....	2,230	5,165,649	296	357,549	2,526	8,017,767

*Excluding Germany, figures for which country are not yet available

6.—MERCHANT VESSELS UNDER CONSTRUCTION ABROAD

Countries	Steamers and Motor Vessels. Steel No.	Steel Gross Tonnage	Wood No.	Wood Gross Tonnage	Sailing Vessels. Steel No.	Steel Gross Tonnage	Wood No.	Wood Gross Tonnage	Total No.	Total Gross Tonnage
British Dominions										
Canada—										
Great Lakes	27	63,493	...	.....	..	.....	...	.....)	....	
Coast	28	100,000	70	81,050	2	975	31	15,525)	209	346,453
Other Dominions	26	70,256	13	11,647	..	.....	12	2,907)		
Belgium	4	7,063	...	.....	..	.....	...	.....	4	7,063
China	7	33,300	...	.....	..	.....	...	.....	7	33,300
Denmark	36	56,001	5	1,170	..	.....	...	.....	41	57,771
France	34	107,215	2	1,920	..	.....	2	480	38	109,615
†Germany	....	.....	...	.....	..	.....	...	.....	....	.....
Greece	1	900	1	600	..	.....	...	.....	2	1,500
Holland	88	219,332	...	.....	..	.....	...	.....	88	219,332
Italy (inc. Trieste)	42	243,940	35	21,605	..	.....	19	6,065	96	271,620
Japan	63	282,060	...	.....	..	.....	...	.....	63	682,060
Norway	40	55,586	24	6,885	..	.....	...	.....	64	62,441
Portugal	....	.....	...	.....	..	.....	29	12,320	29	12,320
Spain	37	118,269	...	.....	..	.....	3	585	40	118,854
Sweden	42	88,650	19	7,155	..	.....	8	1,440	69	97,245
United States:—								)		
Atlantic Coast	357	1,763,551	36	56,240	2	4,600	34	60,728)		
Gulf Ports....	34	141,340	53	126,300	1	4,500	31	68,983)	994	3,874,143
Pacific Coats .	156	933,803	98	238,400	..	.....	59	148,950)		
Great Lakes...	133	326,746	...	.....	..	.....	...	.....)		
Total.....	1,155	*4,612,107	356	553,542	5	10,075	228	317,993	1,744	5,493,717

*Including 14 ferro-concrete vessels of 40,259 tons. †The figures for this Country are not yet available.

The tonnage being built in the world at the end of June under the inspection of the Surveyors of Lloyd's Register, excluding vessels, the construction of which has not actually commenced, and excluding all vessels of less than 100 tons, amounts to 4,766,623 tons.

AIR RESISTANCE OF TRAINS

The advance of aeronautics has, among other things, made engineers generally pay more attention to the importance of so shaping objects which have to move at high speed through the air that they shall offer as little resistance as possible. Anyone who puts his head out of the window of an express gets some idea of the pressure of a sixty-mile-an-hour wind, but he may not give a thought to the fact that the same pressure is helping to retard the progress of the train. It has been calculated that the flat front of a locomotive smoke-box offers sufficient resistance to absorb about 32 h.p. at 60 miles an hour, and 75 h.p. at 80 miles an hour. By giving the smoke box a hemispherical front the figures could be reduced to 7 h.p. and 15 h.p. respectively—a very important decrease. By reducing the width of the buffer beam, avoiding pockets in the sides of the engine, giving the tender sides and a roof of the same height of the carriages, decreasing the gaps between carriages, stream-lining accumulators and air reservoirs and making windows as nearly flush as possible, train resistsance would be greatly lessened. A tapering tail, such as is fitted to a racing car, would have good results, since the suction at the rear of a train is very considerable, but there are practical objections to its use. Experiments made in America showed that a flat-ended electrically propelled carriage could not be driven at 50 miles an hour by power which sufficed to give a similar carriage with parabolic front a speed of over 75 miles an hour. This seems to show that there is plenty of scope for reducing the power bill of our railways by applying to trains some of the care which is expended on designing the lines of a fast steamship.

ELECTRIC BRASS FURNACES DISPLACE OTHER TYPES

One Company Uses 2,500 Kw. for Melting in Three-Phase Furnaces, Another Requires 800 Kw. for One-Phase Induction Furnaces

Brass manufacturers who recently met in the convention of iron and steel electrical engineers at Pittsburgh said that they knew from experience that there are now electric brass furnaces whose metallurgical efficiency justifies their use in preference to fuel-fired furnaces. W. R. Clark, works manager of the Bridgeport (Conn.) Brass Company, spoke on the experience of his company, which has in operation a total of 800 kw. in the Ajax Metal Company's "Wyatt" single-phase, 60-cycle induction furnaces melting brass. He said that the largest furnace has a demand of 75 kw. at 75 per cent. power factor, and its pouring capacity is from 500 lb. to 600 lb. (340 kg. to 290 kg.) per hour. These furnaces have melted and poured from 6 lb. to 9 lb. (2.7 kg. to 4.1 kg.) of brass per kilowatt hour, and the linings are being used for as many as 2,000 heats each. A 75-kw. rating is not the largest for which this type of furnace can be built, but when designed for 60-cycle operation the power factor drops rapidly with increased size. The induction furnace is found to have the advantage of heating the bath from within, automatically stirs the molten metal and has very little tendency to give off spelter. However, the furnace is limited in size and has the disadvantage that it must be started with molten metal from another furnace. This latter characteristic is more of a drawback in a foundry than in a brass mill.

This Bridgeport (Conn.) Brass Company is increasing its electric melting capacity by the addition of a 1-ton (900 kg.) "Detroit" rocking type brass furnace which has opposed arcs from electrodes entering through the centre of an oscillating drum. The voltage across the arc is 65 and the maximum demand is from 250 kw. to 300 kw. per ton. This furnace is expected to melt a ton of brass with from 225 kw. hr. to 300 kw. hr. of energy. The higher consumption is for mixtures high in copper, which require a greater temperature.

It was stated in an informal discussion after the close of the meeting that whereas oil-fired furnaces are limited to a capacity of about 1,000 lb. (450 kg.) of brass each, there are now in operation "Bennett" three-phase brass furnaces with capacities up to 5 tons (4,500 kg.) of brass each. These furnaces have not yet been placed on the market, but there was said to be an installation in actual operation aggregating some 2,500 kw.

Some interesting results were achieved by an investigation into the speed of rusting of steel containing small proportions of copper. The research has shown that the protective influence is exerted by a copper content that would be described by an analyst as a trace. By increasing the copper content from .01 per cent. to .03 per cent., the corrosion is decreased by 30 to 40 per cent. Steel with a considerable excess of sulphur can be protected by a copper percentage of .15.

Eastern and Western Canada Marine Activities

August Correspondence

BRITISH COLUMBIA

PACIFIC shipping is furnishing plenty of action just now, and big events are being chronicled almost every passing day. Freight business between the Orient and the Canadian and American western shore appears to be steadily increasing; the old trade routes to the United Kingdom are being reopened again; tonnage is gradually becoming a more easily obtained commodity. The whole industry is rapidly settling down to a new peace-time basis.

Exporters are still finding it difficult to secure tonnage commensurate with their requirements. There is tremendous business offering, but few ships to handle it. Even though the situation shows some improvement, it is still serious, and lumber interests regard it as particularly fortunate that the vessels being built in Victoria for the French Government, as well as the Vancouver-built steel carriers, are available for lumber transport; otherwise it would be impossible to handle the offshore orders that have recently been given. Charterers on Puget Sound are offering $55 a thousand for lumber ships to carry to the United Kingdom; $55 to the European continent; $35 to $42.50 to Australia; 225 shillings to South Africa; $35 to $37 to the western coast of South America; $50 to Calcutta and Bombay, and $30 to Shanghai and Japan. They are finding it a hard proposition, however, to secure bottoms at any price.

A big stir in shipping circles was caused by the purchase of nine full-powered wooden motorships belonging to the Australian Government by a syndicate of Seattle capitalists and transportation men, headed by Mr. J. E. Chilberg, president of the Scandinavian-American Bank. The deal is said to involve $3,500,000. Five of the vessels concerned are now under construction or just completed in Seattle by the Patterson-McDonald Company, and the remaining four were turned out by the Sloan Shipyard at Olympia, Wash. In disposing of these vessels the Australian Government is following out its policy of concentrating its ship operations upon steel vessels of large tonnage. All the vessels bought by the Seattle interests are of 4,400 tons.

Japanese companies are active in the charter market. The Nippon Yusen Kaisha, premier Japanese shipping corporation, has chartered five vessels, mainly for the Australia and India trade, at rates ranging from $3.75 to $5 a ton.

The Dolaura, the private yacht formerly owned by Hon. James Dunsmuir, of Victoria, and now the property of Arthur Meeker, of Armour & Company, Chicago, returned from a month's cruise in Alaska waters a few days ago, and on landing at Seattle practically the entire crew quit the vessel. They complained of ill-treatment at the hands of the skipper, Captain Jacobbsen, of Chicago, whom they accused of "constant nagging." They also said they had difficulty in getting shore leave and that the food was poor. The cruise was regarded as being generally successful. Three thousand miles were covered without mishap. The Dolaura will go to New York via the Panama Canal.

Hon. C. C. Ballantyne, Minister of Marine, is expected to reach the coast shortly. At Vancouver he will go into the question of harbor improvements, and while in Victoria will investigate some of the details of the big Esquimalt drydock project.

Yarrows, Ltd., of Esquimalt, have been asked to submit estimates of cost on steel freight carriers which the Di Giorgio Company, of New York, recent purchasers of the C.P.R. steamship Princess May, propose to have built to engage in the fruit-carrying trade between New York and the West Indies.

Mr. W. R. Meyer, representative of the Di Giorgio Company, was recently in Victoria, concluding the negotiations for the purchase of the Princess May. It is understood that the purchase price was in the neighborhood of $200,000. Alterations to cost $75,000 will be necessary before the vessel is in shape for the fruit transport trade

The big liner, Fushimi Maru, of the Nippon Yusen Kaisha, was forced to put back to Seattle August 11 with her starboard engine out of commission because of a cracked cylinder head, and her steering apparatus disabled. She was only a few miles out on her passage towards Japan when the trouble occurred. The necessary repairs were effected without delay.

When the steamship War Cavalry, an 8,800-ton product of the Coughlan Shipyards, Vancouver, was off the Costa Rica coast in June on her way towards the United Kingdom via the Panama Canal, a fire broke out in the bunkers just over the boilers, and the heat was so intense that the flame fighting operations had to be carried out in three-minute shifts. The fire lasted twenty-four hours. The Forbes Corporation, of New York, owns the War Cavalry, which was not materially damaged by the outbreak.

The continued strike at Sydney, N.S.W., of stevedores and other workers indispensable to shipping, has completely tied up the sailing schedules of the Canadian-Australian Royal Mail Line, and the Niagara and Makura are both held at the docks. When the Makura was last on this coast the Vancouver strike made it impossible to unload the whole of the cargo.

Mr. H. M. Davey, of the Department of Public Works, has been carrying out test borings at the Lang Cove, Esquimalt, site of the big Federal drydock, and when the work is completed tenders will at once be called for. Mr. W. A. Gourlay, resident Government engineer on the Ogden Point and Outer Docks contracts, will represent the Government when the dry dock construction is proceeded with.

Making her first appearance in these waters since pre-war days, the Harrison Direct steamship Crown of Galicia, Captain Baird, docked at Victoria from the United Kingdom a few days ago. The Crown of Galicia, while under the command of Captain Halliday, acted as collier to the ill-fated squadron under Admiral Sir Christopher Cradock, prior to the battle off the Chilean coast. Later, the crew of the Crown of Galicia witnessed the sinking of Von Spee's commerce raiders off the Falklands after combat with Vice-Admiral Sturdee's ships. The liner was commissioned to carry the German prisoners picked up after the battle to England.

The Department of the Naval Service recently loaned the patrol boat Resdless to the Victoria branch of the Navy League for the purpose of carrying out an instructional cruise for boys who hope to subsequently join Canada's navy or merchant marine. Under command of Captain Moore, the Restless made a cruise to Ladysmith and return. The voyage was the first of a series.

The British freighter Memnon is the next Blue Funnel liner scheduled to come to the Pacific coast from the United Kingdom via the Panama Canal. The Astyanax, first of the fleet to come here after the war, left recently on her return voyage to the Atlantic. The Protesilaus, operating in the Blue Funnel trans-Pacific service, reached Victoria in mid-August.

Capt. A. W. Davison, R.N.R., has been promoted to the shore berth of marine superintendent for the Canadian Pacific Ocean Services at Hong Kong. Before the war he was in command of the C.P.O.S. liner Empress of Russia, and previous to that had walked the bridge of the Empress of China, the Tartar, Monteagle, Empress of Japan. In 1916 Captain Davison was transferred to the Empress of Asia, and he commanded her while engaged as a troop transport in the Atlantic run.

With the acceptance of a contract to build a wooden excursion steamer for the Union Steamship Company, the B.C. Marine Railway, of Vancouver, entered the shipbuilding industry. The vessel will be 145 feet in length. The Union Steamship Company, according to Manager E. H. Beazley, is contemplating the construction on this coast of several steel steamers.

The C.P.R. steamer Princess Ena recently met with an accident in Seymour Narrows when she fouled Ripple Rock,

a submerged reef. A considerable quantity of water was shipped, but pumps kept the vessel in a safe condition until she was beached at Plumper's Bay. The Princess Ena was finally taken to Victoria and repairs were completed by the Victoria Machinery Company in about two weeks.

EASTERN CANADA

THE Canadian Government steamer, "Canadian Miller," launched from the yard of the Canadian Vickers, Ltd., on the 16th of this month, is the fifth vessel this company has launched for the merchant marine service of the Dominion Government. With the exception of the first, which was of smaller size, they have all exceeded a deadweight capacity of 8,000 tons, the most recent addition being capable of carrying a cargo of approximately 8,500 tons. The length between the perpendiculars is 400 feet and her moulded breadth is 52 feet. The moulded depth is 31 feet and her moulded draft is 25 feet. She will have an estimated speed of 11 knots. She is now being fitted with boilers and engines and outrigging, and in the course of about three weeks will be ready for her trial trips. A feature of special interest in connection with this latest addition to the national service is that all materials and equipment entering into the construction, with the exception of the plates, anchors and chains, has been supplied and fabricated in Canada. When the Canadian Miller is delivered it will bring the total deadweight tonnage delivered by the Canadian Vickers Company to the Government to about 40,000 tons. Three other similar vessels are now under construction at this yard for the Dominion Government, also a vessel for the French Government. The Canadian Seigneur, a sister ship of the Canadian Miller, has just recently completed her trial trips, and is now in the harbor taking on cargo for her maiden voyage. With the completion of the vessels now on the stocks it is expected that others will be started for the Government, as the unceasing efforts of the Hon. C. C. Ballantyne, Minister of Marine and Fisheries, have resulted in the Dominion Government embarking on an extensive national ship program, with which she is determined to get back the control of her overseas trade. This is a natural and national industry, and Canada is quite capable of carrying it out successfully, because today she is able to build ships equal in quality to those of any country in the world.

The shipping firm of Furness, Withy and Company, Ltd., of Montreal, have taken over the interests of Wm. Thomson and Co. of St. John, N.B., and the latter port will be the centre of new activities for the new firm. Further announcements as to future plans will be made at an early date.

Fishing operations in the Strait of Belle Isle and along the southern coast of Labrador and the northern coast of Newfoundland have been seriously hampered this season, owing to the continued presence of icebergs and field ice in the vicinity. Late last month it was very difficult for vessels to pass the ice blockade, and as many as 400 craft were met by one boat, the steamer Diana, on her first trip of the season last month to Labrador.

Heavy rain storms, toward the end of July, in the vicinity of Beauceville and St. Joseph, in the Province of Quebec, resulted in considerable damage to adjoining property, the Chaudiere River overflowing its banks in some sections.

Early in the month the port of Montreal saw a couple of interesting ocean vessels of a type designed to combat the submarine menace. These boats were the War Dream and the War Brunswick, constructed at Belfast by Harland and Wolff, and put into commission this spring. They are of a standard pattern and adopted during the war; the sides, instead of being rounded, are straight slopes, which permits of plates being easily replaced in case of damage. The stern has the appearance of the letter "V."

Direct passenger service between this country and France was inaugurated this month, when the steamship California of the Cie-Canadienne Transatlantique sailed on the 7th for the port of Havre. This vessel is one of 9,000 tons and offers second and third class accommodation.

On the night of August the 8th, while making an inspection of the S.S. War Witch in the harbor of North Sydney, Captain Ronald McDonald, harbor master of the port, was stricken with paralysis and died shortly afterwards. Capt. McDonald was 74 years of age, and was one of the best known master mariners in the Province of Nova Scotia. He first sailed from Arichat as a boy and secured his master's papers about 1877. His last boat was the four-masted steel ship Muskoka. His eldest son, a sergeant in the Black Watch, was killed in the siege of Kut-el-Amara in Mesopotamia.

Early in the month the eighth and last of a fleet of wooden vessels for the French Government was launched from the yard of the Fraser Brace Company at Cote St. Paul, Montreal. The release of the vessel was performed by the wife of Captain Quedrue, representative of the French High Commissioner. The vessels here are known as numbers, as the names have been left for the selection of the owners when the boats are taken over. It is interesting to note that the width of the basin where the vessel took the water was little more than the width of the boat. The eight vessels are now in the turning basin of the canal adjoining the shipyard and are being fitted out with boilers and engines and outrigging. The boats are of 1,500 tons deadweight capacity, with a length of 202 feet, a beam of about 40 feet, and a depth of 17 feet 6 inches. They are fitted with twin screw engines of 600 h.p. During the latter part of the present season the basin has been fitted up as a dry dock, and some of the lake boats have been docked here for repairs. It is thought that the location may be permanently utilized for a ship repair drydock.

CARDIFF AND CANADA

Mr. H. B. Thomson, late Food Controller of Canada, and now a member of the Canadian Mission in London for the promotion of trade relations with Canada, was the guest of the members of the Cardiff Rotary Club.

In the course of a speech dealing with trade relations of Canada and this country and the great commercial warfare which had to be faced in the future, he asked why the city of Cardiff should not take the opportunity of associating with the city of Montreal in the establishment of a line of steamers direct from Canada to Cardiff. He knew the shipping situation was difficult, but they had got to look to the future. The shipping situation was going to change. The people of Canada would greatly like to see a line of steamers running between Montreal and Cardiff.

Sir John Courtis said that some years ago he visited Canada, and he and others who accompanied him were much impressed with the potentialities of that country. Although their visit was in connection with emigration, he took the opportunity of driving home that there was no reason why a line of steamers should not be run between Montreal and Cardiff instead of Avonmouth. He impressed upon them that Cardiff was the most important port, and that it would be more convenient for the discharge of their cargoes. Unfortunately the war had intervened, but he knew that business men realized that trade relations with Canada were most desirable, and nothing would give him greater satisfaction than to press for the establishment of such a line of steamers.

It was decided to forward a resolution to the Cardiff City Council Development Committee, the Chamber of Commerce, and the Shipowners' Association, pointing out the desirability of establishing a line of steamers between Cardiff and Montreal.

The discovery of helium in natural gas, both in Canada and the United States, has brought the price of this element down from over $1,000 a cubic foot to a merely nominal figure and has rendered it possible to use it for the inflation of balloons.

For a long time the waste steam from steam-engines has been turned to good account, but there have been difficulties in the way of using the exhaust gases from a gas-engine as they readily attack the metal of the conduits. However, the difficulty is being overcome, for a New Jersey candy factory has an installation in connection with a sixty horsepower engine which is used to heat the factory. The gases pass through an economizer made of cast-iron, with the passages to the different sections staggered so that all parts are heated for the whole length. Water circulates in jackets surrounding the gas passages.

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

AS the steam engine, the Diesel engine and the steam turbine are all heat engines, it is necessary for the student of marine engineering to get a firm grasp of the theory of heat. When this is understood its application in the various forms of marine and other engines can be readily understood.

To begin with, the student must learn to disassociate the terms temperature and heat. To the average man, the one term means the same as the other, but to the engineer there is a distinct meaning to each.

Sensible heat, or temperature, is heat that is capable of being measured on a thermometer, or in other words, that can be appreciated by the sense of sight. The temperature of a room, the water that we drink, or the flame of a fire can be felt, and can be read on the scale of a thermometer, but heat itself can neither be seen nor felt.

Before the present scientific theory of heat was accepted, heat was supposed to be a substance, but research and experiment have proved that heat is a form of energy or motion.

Since heat is a form of energy, and as such can be employed to do useful work, we must have definite units by which it can be measured. The unit of work is a foot pound and is the amount of work which is performed when a weight of one pound is raised one foot. This is not affected by the rate at which the work is performed. It does not matter if it takes one second, one hour, or one year. The actual work is one foot pound.

The unit of heat, or, as it is commonly called, the British thermal unit, is the amount of heat required to raise one pound of fresh water one degree in temperature when at its maximum density, that is from 39 degrees to 40 degrees Fahrenheit.

Now, clearly, if there is a definite relation of work to heat there is a definite relation of the units of one to the units of the other.

Although many investigations and experiments have been made, the unit determined by the famous Joule is the accepted one, though it has been modified slightly by later experiments. He found that the mechanical energy required to raise one pound of water one degree was 772 foot pounds. This has since been modified to 778 foot pounds, which is the accepted standard at the present day. The student can find the experiment described in detail in almost any good book on elementary mechanics or steam. This unit has been named Joule's equivalent, in honor of the investigator.

The Nature of Heat

Heat can be transferred from one body to another, and in so doing affects the body to which it is transferred in one or two ways—it either increases the temperature of that body or changes its state, and the body from which it is transferred is lowered in temperature or has its state changed. It may both raise the temperature and change the state of the body, but the one effect precedes the other, and between the two we get the phenomena of latent heat.

Latent Heat

Latent heat is so called because its effect is not apparent to the senses, but is absorbed in the substance which it enters, its only effect being to change its state. It is this latent heat which is the most important to engineers, because it is the energy stored up in it that enables them to utilize the expansion of steam to perform useful work in an engine or turbine. It is also the latent heat of ammonia, carbon dioxide, and sulphur dioxide which makes refrigeration a commercial possibility. It is most important that the properties of latent heat should be thoroughly understood.

If we take an open saucepan and fill it with water, and hang a thermometer over it with the bulb in the water and place it over the fire, the temperature as shown by the mercury will rise. This rise will go on until the mercury shows 212 degrees on the Fahrenheit scale. If the water had a temperature of 40 degrees when we placed it on the fire the amount of heat transferred to the water would be 212—40 = 172 units for every pound of water in the pan. Suppose the pan held 10 pounds of water, we should have 720 heat units, or British thermal units, commonly called B.t.u.'s. Now if we allow the water to boil away, keeping the bulb of the thermometer in the water as it goes down until none remains, we should still find that the thermometer reads 212 degrees. Clearly, if the heat has been going into the water all this time we must have added a considerable number of heat units, but all we have to show is the same reading. All the heat added since our thermometer reached 212 degrees has been absorbed in making the change from water into steam. It has become latent heat, and the number of heat units required to change one pound of water to one pound of steam at atmospheric pressure is 966.6, therefore the total number of heat units required to change our 10 pounds of water at 40 degrees Fahrenheit and at the pressure of the atmosphere to 10 pounds of steam at 212 degrees and the same pressure would be $(212—40 + 966.6) \times 10 =$ 10,386 B.t.u. This amount of heat represents a mechanical energy of $10386 \times 778 = 8{,}080{,}308$ foot pounds. If this work was done in one minute the equivalent horsepower would be $8{,}080{,}308 \div 33{,}000 = 244.8$ h.p. Let us take a further illustration. Suppose we have a block of ice weighing ten pounds, and we place it in a refrigerator, the temperature of which is above the freezing point, 32 degrees Fahrenheit. Instead of allowing the water to drip away as the ice melts, catch it all in a pan, and when the ice has finally melted, read the temperature of the water. It will be found to be immediately after melting the same as the ice was before melting, but the temperature of the refrigerator will have lowered. What is it that has lowered the temperature? It is the heat that has been absorbed into the ice to change its state from a solid to a liquid, and is 140 B.t.u.'s for every pound of ice changed into water. In other words, if you would have had to transfer 1,400 B.t.u.'s into the ice at 32 degrees to get ten pounds of water at 32 degrees. From this we get the latent heat of ice and water at atmospheric pressure, 140 and 966.6 respectively.

The foregoing constitutes what is known as the first law of thermodynamics, and is stated as follows:

Heat and work are mutually convertible, and heat requires for its production and produces by its disappearance, mechanical energy in the proportion of 778 foot pounds for each unit of heat.

An American contemporary prefers the old name of "hobo" because it is easier to pronounce than the modern name of "Bolshevik."

For hundreds of years Mexican Indians had a horror of what they called the pest spot of Lake Chapala, near the shore at Tizapan, say the "New York Evening Post." They would not bathe in it or sail around it, declaring that the water was oily. Then, after a time, they cautiously began to paint their wooden boats with this oil, which proved so effective in keeping out the water that it became the general custom to use it. They did not know that this was petroleum gushing up through the water—a magnificent flow, about two miles out in the lake, which to this day gushes apparently without varying. When the water is low, petroleum floats in solid masses, each large globule weighing about twenty-five pounds.

The Natives Took Kindly to the Material

By T. H. FENNER, Editor Marine Engineering

SINCE boiler pressures rose from the neighborhood of 15 pounds per square inch to the levels of 100 pounds and over, the question of scale and its prevention, or scale and its cure, has been a live one.

Elimination of scale has given rise to as many nostrums as the curing of coughs or indigestion, and most of the remedies have been made up on much the same principle. The fundamental principle of a boiler compound, like that of a patent medicine, is to make a good profit for the perpetrator, and if it incidentally achieves good while performing the larger object, so much the better.

There are so many more people than boilers that marketing the patent medicine is a much more simple business than selling the compound. Returns are so quick that much money can be spent on display advertising, and a catalogue containing a list of symptoms and a few miraculous cures will get the thing going. Another thing in favor of the patent medicine is that the human being who is afflicted, or thinks that he is afflicted, will pour anything down his throat that sympathetic advisers can think of. The more it upsets him the more good it is evidently doing. Makers of boiler compounds take advantage of this peculiar psychology in getting their medicine for congested boilers into the plant.

There are many ways of treating the scale that accumulates in a boiler, one of the best being not to allow it to accumulate in the first place. Another is by employing some recognized dissolving agency, known to be of use in these cases and possessing no harmful ingredients. Probably the worst way is to listen to the honeyed words of some clever salesman, who has never had any close acquaintance with a boiler, but possesses persuasive power of the highest order.

There is the other kind of salesman, who, after a few preliminaries gets down to business in this way. He backs the engineer into a corner of the boiler or engine room and tells him that he will split half the price of the barrel with him if the engineer will use his influence to get it purchased. Now this will not work often, but the man who employs these methods usually knows who to try them on.

I have heard of compounds that were almost human in their intelligence. They would, immediately on being introduced into the boiler, make a tour of the shell and tubes and find out just what state they were in. The compound would then remove the scale from surfaces where it was detrimental, and use some of it for plugging leaks, precipitating the remainder.

Some would both remove scale and give the boiler a protective coat against corrosion, prevent foaming, and add at least 100 per cent. to the general efficiency of the boiler.

The ingredients of course were a dark secret, but usually a pretty shrewd guess can be made. The chief constituent, as in most specifics, is water. The second is some substance that will impart a pretty shade to the mixture and at the same time give it a smell that will tend to prohibit it too close investigation. The basic ingredient is soda in some form or other. Occasionally, however, a boiler compound appears that has some intrinsic merit for other purposes than cleaning boilers, and it is about one of these that I started to write.

Some years ago I was second engineer of a steamer running from an English port to the Mediterranean. She was one of a line of six steamers, making monthly sailings. Owing to the fact that there was ample opportunity of getting fresh water cheap at all the ports we visited, and using the evaporator very little for makeup, the boilers were always in good shape. Added to this was the fact that we had always about three weeks in the home port, there was ample time to make a good job of cleaning. Under these circumstances we never thought of such a thing as boiler compounds in connection with our vessel.

We were just getting ready for sailing, on one occasion. As second engineer, I was busy getting our stores aboard, and was pretty near finished this interesting, if not worrying, task. I was in a hurry, for we were sailing on the next tide, which was about three o'clock in the morning, and I wanted to get ashore for a few hours before we left. The last barrel of oil was being emptied into the engine room tanks, and the men were unloading paint from a truck on the dock wall. Fifteen minutes would see the job finished, and I would set the men on watches, and make a break for town. A messenger boy hurried up the gangway, and asked for the chief engineer. I directed him to the chief's room, and thought no more about him. If I had only known what he carried I would have dropped him in the dock, and left him there till I got away. However, I didn't. In about two minutes the chief came up on deck, with a note in his hand, and a woebegone look on his face. I scented trouble. He came over to me, and, without saying a word, handed me a note. It bore the heading, "Superintendent's Office." I read it twice before I could believe it. This is what I read. It was addressed to the chief, and then went on, "I am sending you, before sailing, 24 (twenty-four) drums of "Ananias" boiler compound. You will use this on the present voyage, and give me a full report on your return. This compound should be at the dock when you get this letter, or immediately after. Don't fail to take it aboard." The first thing that came to my mind was, "Where can we put it?" The idea of following the super's advice and using it was far from my thoughts. I put the question to the chief. "Mr. —, he replied, "if I have to look after the ship's stores then I need another second"; with this pleasing remark he went ashore and left me to tackle this white elephant that had been wished onto us. While I was still thinking, a lorry drove down with the infernal stuff aboard. I called my men, and got it unloaded and standing on the deck, and then went to look for the mate. He and I were very good friends. "Look here, old chap," I said to him, "can you do me a favor?" "I will if I can," he replied. "Very well then. I have a consignment of stuff that I have no use and no room for. Can you put it in the forepeak?" "I'm sorry," he replied, "but the forepeak is full. Why don't you put it where you put the oil last voyage?" This was a very nasty remark, and quite uncalled for. It was like this. The previous voyage we had more oil than we could get in the tanks, and I had lashed a couple of barrels on deck till we could make room. It was summer time, and I had not anticipated any bad weather, but we got it. The result was, that on coming on watch one morning at four o'clock, I was just in time to see the two barrels floating over the lee rail. A bit of bad steering had let the vessel fall off, and she had shipped enough water on the after deck to wash my barrels out of their lashings. I had heard quite enough about those barrels to be able to dispense with any reminders.

Well, I got those drums into the engine room. Some went into the store room, and some on the top grating, and a couple on the bottom platform, round the back of the engine room, and I departed for my delayed visit ashore.

Next day, going down channel, I said to the chief, "Well, when do we start putting the compound in the boiler?"

"Not so long as I am chief," he replied.

"Very well, then," I said. "Shall I dump it overboard on the morning watch?"

"Not so," said the chief. "I have an idea that we can use that stuff, down the coast."

Not knowing what he meant, I said

no more. It was shortly after this that a use for all we had developed.

The fourth was doing something up on the middle grating, and dropped a 14-lb. hammer down on top of one of the drums, which it naturally went through. He came down to recover the hammer and, in his efforts to extricate it from the drum, he upset the whole thing, and our valuable compound ran all over the back platform. Now, part of this platform was of plank, and it had always been a sore point to try and keep it clean, because it was a handy place to wash before coming off watch.

The fourth got a man around to help clean up the mess and, wonderful to relate, wherever the stuff had touched, the planks were white as snow. He was so surprised that he came up after me, and I went down to look it over. The appearance of that platform was a delight to the eye. I got an empty paint pot and put some of the compound in it, and took it up on deck. I found a piece of the deck outside of the galley, that was pretty well stained, and applied the clean-all to it. In two minutes it was white.

This was too good a thing to lose. I made an inventory of my stores, and found I was a bit short of white zinc. I again approached the mate. "How are you fixed for white zinc?" I asked him. He looked suspicious, but replied he had enough. "All right then, if you will give me a couple of drums of white zinc, I will give you a couple of drums of my boiler compound." "No doubt you would," he sneered. "What use would it be to me?" This was what I wanted. "Come here and I'll show you." I took him over to the deck I had cleaned. His eyes lit up joyfully, and he called over to the bos'un, "Give the second two drums of white zinc," he ordered, "and get two drums of that stuff from below."

I told the chief about it. "Just what I thought," he said. "I have had something like that before. Now," he said, "do you savvy what we can do with it down the coast?"

"I have a glimmering," I replied.

Anybody who has ever traded down the Mediterranean can tell you the value set on soap by the inhabitants of these shores. That is because it is a government monopoly, and is scarce and expensive. We always carried a good stock of soap in our rooms and used it as a means of trade. What can be bought down there with a few bars of soap would surprise anyone who has not experienced it. Now, this compound evidently was not soap, but it would achieve some of the results. The next thing was to try it out on a suit of overalls that had done duty in the engine room for a while. A bucket of hot water, a little soft soap, and a half cupful of our compound made a new boiler suit. I gave the men a drum for their fo'c'sle, to wash their floor and their clothes, and waited eagerly for the first report.

The chief conducted the negotiations. He took the ship chandler into his room and showed him what could be done. That night three drums went ashore, and a barrel of grapes came aboard. We had a few more ports to visit, and results were very satisfactory. I suggested that we had better keep some, so as not to have appeared to use it up too fast. "My boy," said the chief, "when you have been at sea as long as I have you will know more. If we take any of that stuff back the super will fire us. It has served his purpose, as it is now serving ours. Keep a drum for your back platform, and one for the men's foc's'le, and you might trade another drum with the mate. I'll look after the rest and will be able to report that we found it easy to use and excellent in its results. Everyone will be satisfied and we will never see any more of it."

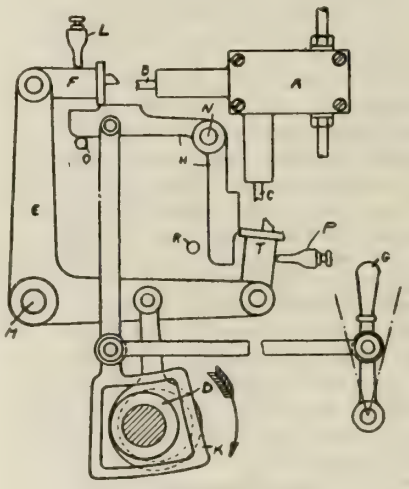
And that is how it worked out.

THE BOLINDER OIL ENGINE

A Correction From Last Issue

In our article on the Bolinder engine in the July issue of MARINE ENGINEER, the cut used to describe the reversing gear was not the correct one, the text therefore being made incomprehensible. We are therefore publishing the correct cut, and reprinting the text to clear this matter up.

Another unfortunate error was also made in the heading of the article,



THE REVERSING GEAR.

where it was stated that the engine was designed by Burmeister & Wain. This of course would be recognized as a mistake by most of our readers, but we take this opportunity of stating that the Bolinder engine is quite distinct from that made by Burmeister & Wain, and the mention of the latter name in the heading was a typographical error.

The Reversing Apparatus

The reversing of the engine's direction of rotation is effected by means of pre-ignition without appealing to any external source of power such as compressed air, or other complicated devices.

The reversing is accomplished in 4 to 5 seconds, and may be performed repeatedly without a hitch, which is not possible when using compressed air.

The construction of the reversing apparatus is briefly as follows:

"A" is an oil fuel pump having two plungers "B" and "C." The plunger "B" is adapted to work during normal conditions when the engine is running in one direction or another, while the other "C" is used for reversing. An eccentric on the main shaft imparts a rocking motion of the lever "E," which latter is moving round the bolt "M." To this lever two strikers "F" and "T" are attached, which, operating the two plungers "B" and "C," slide on two faces on the angle-piece "H." This angle-piece has a motion round the bolt "N," the extent of which is determined by the abutments "O" and "R."

At "L" and "P" there is one spring to control the speed and the amount of fuel supplied to the cylinder. The link "K" surrounding the disc "D" is connected by a rod with the angle-piece "H," which latter can be lifted from the abutment "O," and at the same time moved towards the abutment "R," thus engaging the inside vertical edge of the link "K." The striker "T" is thereby means of the reversing lever "G."

Suppose the engine is running ahead in the direction of the arrow, the angle-piece "H" is then pressed against the abutment "O" on account of its own weight and also by the weight of the link "K." The striker "T" is thereby raised so that it cannot strike the plunger "C," while on the other hand the striker "F," working during normal running for ahead or astern, takes up such a position as to be able to strike the pump plunger "B." The reversal of the direction of movement of the engine takes place in the following manner:

The reversing lever "G" is pulled aft so that the edge of the link "K" is brought into engagement with the friction disc "D," which is thereby lifted.

The horizontal part of the angle-piece "H" is thus lifted from the abutment "O," thereby raising the striker "F" so that it cannot strike the plunger "B." The engine will in such a manner, owing to this and to the spring "P," slow down automatically to a speed suitable for reversing. While the horizontal part of the angle-piece "H" was lifted as above, the vertical part of the same angle-piece "H" is moved from the position illustrated towards the abutment "R," giving the striker "T" the position in which it will press the plunger "C" inwardly and consequently feeding one charge of fuel into the cylinder. This sand separated from the casting. This will explode before the working piston has reached its upper position. The piston is thus stopped, driven backwards, and the engine begins to move in the opposite direction.

Immediately the engine has begun to rotate in the opposite direction the link "K" is moved downwards due to the friction created by the disc "D." On account of this the horizontal part of the angle-piece "H" is automatically shifted towards the abutment "O" so that the striker "F" is again made operative and the striker "T" is thrown out of action.

If the engine is to be reversed from astern to ahead, the lever "G" should

be pulled aft and the reversal will take place as described above.

The simplicity and the few working parts enable the Bolinder engine to be operated without keeping an expensive stock of repair parts on board. There are no cams, valves, gearing, electric ignition or vaporizer to get out of order.

The Bolinder is made to a standard gauge, therefore all parts are interchangeable, and replacements can be ordered with absolute certainty of their fitting accurately.

The Bolinder engine is marketed in Canada by the Swedish Steel and Importing Co., Ltd., Montreal.

THE DEVELOPMENT OF THE NORFOLK OIL SHALES

Within the next few weeks the development of the extensive oil shale deposits which have been discovered to exist over an area now placed at 150 square miles, and lying to the south of King's Lynn, will be commenced upon a commercial basis, for the first report is approaching completion. These immensely rich Norfolk shales have been known to exist for many years, though until quite recently their extent was not established. To-day, however, it has been found, by sinking of sixteen test wells, that to a depth of three hundred feet no less than 160 feet of workable shales exist, the first seam yields crude oil which contains high percentages of sulphur—a great drawback to profitable development—but the whole of the other seams are sulphur free. Their richness increases with the depth, the lower series of shales being ozokerite in character, and cut like a paraffin candle. The crude oil is contained in the shales to an extent of over sixty gallons per ton, the shales thus being three times as rich as those in the Scottish fields. Dr. W. Forbes Leslie, who has made a careful survey of the Norfolk properties, estimates that the oil shale content of them is in excess of 1,000,000,000 tons, and Major-General Sir George Scott Moncrieff, K.C.B., the late director of Fortifications and Works, War Office (the managing director of English Oilfields, Ltd., which has secured the whole of the areas), asserts that there is more than sufficient petroleum available to meet all our home requirements for many years.

During the present week, in two new tests which are being bored on the properties, even richer shale seams have been proved, while strong gas pressures and liquid petroleum have also been encountered. It is highly probable, says Dr. Leslie, that liquid petroleum in commercial quantities may be found beneath the shale beds. It is intended to eventually find employment for at least £10,000,000—the proposition is so immense.

THE ISHERWOOD REGISTER OF SHIP CONSTRUCTION

In view of much that has taken place in the proceedings of the North-East Coast Institution victory meeting, it is of interest to note that there has just been issued the world's first register of ships built on longitudinal framing, and which are all on the Isherwood system. The register is an important record to all maritime nations. It gives details of a thousand ships which, within a period of a little over twelve years, have been constructed in various parts of the world on the system invented by Mr. J. W. Isherwood, who thus holds this remarkably unique position in the art of naval architecture and the science of ship construction.

The register will be of great value to shipowners and shipbuilders alike, inasmuch as the information given covers the type of ship, the tonnage, gross and net, the classification, the name of the builders, the date of launching, the owners, the dimensions, the free board draft, the class of machinery, and names of makers.

The register thus indicates the general adaptability of Mr. Isherwood's system to practically every type of vessel afloat, embodying the dual advantages of greater deadweight carrying capacity over the transverse system, and the economic saving in material and cost of construction. Practically the whole of the oil carriers on the ocean are to Mr. Isherwood's design. That in itself is an enormous tribute to the proven success of the system.

But a perusal of the register indicates that owners and builders have found it profitable to apply the longitudinal system as devised and patented by Mr. Isherwood to passenger and cargo liners, to large and small tramp steamers, to special types, such as corn, fruit, or coal freighters, to warships, and even to dredgers, and other small craft. It does not, however, contain details of many other ships built for war purposes, which will no doubt appear in a later edition.

There are also included in the register upwards of one hundred well-known shipbuilding firms in various parts of the world, who are licensed to construct vessels on the Isherwood system.

BRITISH SHIPBUILDING

Syren and Shipping, London, have issued a special supplement dealing with British shipbuilding, which calls for most favorable comment.

The editorial contents open with an article on "Shipbuilding and Designing," by A. L. Ayre, honors medallist and King's prizeman, which is practically a complete book on this subject, profusely illustrated with diagrams. Following this are well-illustrated articles on the most prominent yards in the United Kingdom and Ireland, with many interesting photographs of vessels damaged by torpedo and mine. The various yards and engineering works are also well illustrated.

A complete list of British shipbuilders and marine engineers is included in the publication, which is issued at the price of five shillings. It is worth considerably more than this sum, and Syren and Shipping are to be congratulated on the issue of such a magnificent number.

RECEIVE IMPERIAL SERVICE MEDAL

The following servants of the Canadian Department of Railways and Canals have been awarded the Imperial Service Medal:

Albert J. Atkinson, time-keeper, Moncton; Placide Babineau, carpenter, Moncton; Alexander Bain, station agent, Riverdale; Geo. T. Biddington, locomotive fireman, Moncton; John S. Cameron, section foreman, Penniac; W. D Cantwell, toolroom keeper, Charlottetown; John Corbett, section foreman, Moncton; Harry Cummings, hostler, Stellarton; Aime Dumas, conductor, Riviere du Loup; John A. Fraser, machinist, Moncton; J. M. Grant, section foreman, Riviere du Loup; Jos. Guay, brakeman, Levis; Alfred Lebel, conductor, Riviere du Loup; Charles Mercier, engineman, Riviere du Loup; R. W. Orchard, conductor, Mont Joli; Jules P. Parent, engineman, Riviere du Loup; A. C. Reid, carpenter, Moncton; Francis W. Rioux, engineman, Riviere du Loup; Jos. Scott, engineman, Riviere du Loup; Benjamin Steeves, section foreman, Campbellton; Matthew C. Webster, station agent, Pictou; Job Yeo, engineman, Charlottetown.

A concern has been formed in Denmark to begin the manufacture of typewriters.

Don't let your competitors fix the price of your product—fix it yourself to cover your costs and a reasonable profit.

It is said that the waste of timber in the yellow pine industry alone is sufficient to furnish raw material for the daily production of 40,000 tons of paper, 3,000 tons of rosin, 300,000 gallons of turpentine and 600,000 gallons of grain alcohol.

Next time you "light up," think of this:

About 10,000 matches are scratched in this country every second that passes, and of these 95 per cent. are used by smokers to fire pipe, cigar, or cigarette.

The man whose head for figures turned out that information also estimates that the time lost by the smokers in lighting matches—not in smoking—is worth $513,024 each eight-hour working day.

He arrives at his estimate by figuring that it takes fifteen seconds to scratch a match and use the light, and that 213,759 men, whose time is worth thirty cents an hour, are holding matches at the same time, thus losing golden minutes at the rate of $1,068 a minute, or $64,128 an hour.

No one, so far as we can learn, has figured out how large a percentage of the match-scratchers throw away the matches while they are still burning, but it has been estimated that half of the fires which cost the United States $250,000,000 a year are caused by carelessness.

Wood, phosphorus, chlorate of potash, rosin, whiting, and powdered flint are the makings of this little device.

The Various Mechanical Properties of Steel

Taking Up the Consideration of the Question of Brittleness, Together With Investigation of Failures of Various Kinds. A Paper of This Nature on Steel is Especially Valuable at the Present Time

By W. H. HATFIELD, D. Met. of the Brown-Firth Research Laboratory, Sheffield, Associate Member

IN a recent paper previously referred to, Rosenhain and Hanson describe an investigation into the cause of cracking in a thick boiler plate. The failure examined occurred in the last stage of manufacture, that is, cracking during cold bending. The authors present interesting data, and the results of subsidiary experiments bearing upon the case. They deduce that the cause of failure lay in the growth of large crystals in the ferritic bands, claiming such crystalline growth to be responsible for the low impact value of the material, and that the low impact value of the material was an indication of the mechanical properties which produced failure. The processes through which this particular plate had passed were those through which other plates had passed which had not cracked, and the author's conclusions would have been more convincing if they had definitely shown that successful plates had not possessed the same features which they condemned in the plate which had failed. One would rather suspect that the breakage of this plate was due to the presence of mechanical defects or the production of small incipient flaws by over-bending in the cold. Unfortunately, the stages of bending are not published. The author discusses this paper now, since it has a direct bearing upon the technical points which he hopes to bring forward later.

Another well-investigated failure is that of the St. Neots rail. This failure was the subject of a Board of Trade Inquiry. It has also been dealt with by Dr. Arnold, F.R.S.; Dr. Stead, F.R.S., and others. Here we have an extremely valuable instance of a failure with many well-authenticated details. The rail was 22 years old, and it had worn down 5-16 in. under traffic abrasion; it then subsequently smashed into a number of pieces, causing the well-known disaster. One eminent investigator states that thousands of rails of worse composition had served satisfactorily. The mechanical properties, as shown by the tensile tests, were good. One extremely important feature, however, seems to be that the upper surface of the rail consisted in many parts of a martensitic layer (layer of hardened steel). This layer contained thousands of hair cracks. Such a martensitic layer may conceivably have been produced by abnormal effect of the brakes, and such a layer would yield the minute cracks just described under subsequent usage. The main points that it is wished to record are:

1. The original satisfactory condition of the rail as proved by the satisfactory behaviour over 22 years.
2. Its mechanical condition.
3. The presence of surface cracks.

Leaving this case for the present it is proposed to describe an interesting case which recently came to the author for investigation. He was informed of a case in which a piece of structural steel (angle-iron) made from shell discard, had broken sharply in two with a blow from a 14-lb. hammer. The fracture is illustrated in Fig. 1, page . He was incidentally informed that this occurrence had raised grave doubts in the minds of the firm concerned with regard to the advisability of the extended use of such material. In due course the pieces came into his hands, and an investigation was entered into with considerable enthusiasm, as here indeed was apparently an instance of really brittle steel. In the first place the chemical composition of the material was determined, and it was immediately found that the steel was not shell discard but low-carbon structural steel. That discovery, in itself, as will be appreciated, was quite an important one when present circumstances are considered. The figures obtained in the analysis were as follows:

	Per Cent.
Carbon	0.09
Manganese	0.65
Silicon	0.017
Sulphur	0.038
Phosphorus	0.061
Tungsten	Nil
Chromium	Nil
Nickel	Nil
Vanadium	Nil
Titanium	Nil

Microsections were prepared and the microstructure of the steel studied. In Fig. 2 will be found a photograph of the unetched structure which gives an idea of the amount of non-metallic inclusions present. There is, of course, always more or less of this non-metallic matter in these structural steels, and its layout is always parallel to the direction of rolling; hence in this particular instance the inclusions were in path at right angles to the fracture. In Fig. 3 will be found the etched structure at 100 diameters and the amount of pearlite, together with the size of crystal, can be studied. In Fig. 4 will be found the microstructure of the material at 500 diameters, and this particular photomicrograph enables the condition of the pearlite to be examined. The author did not consider that the micro-examination brought out anything abnormal, but found that it confirmed the results of analysis.

The mechanical properties of the material were next studied in proximity to the fracture. The tensile values, includ-

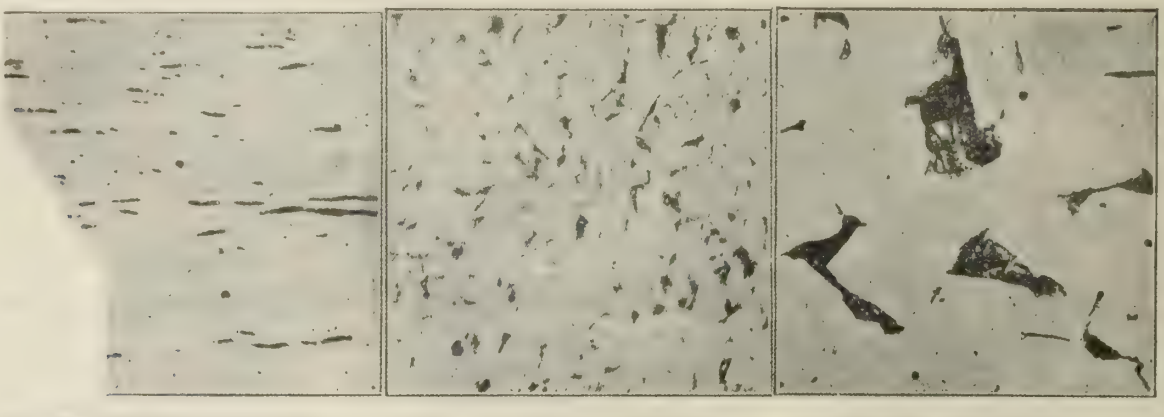


FIG. 2 UNETCHED x100 DIAM. FIG. 3—x 100 DIAM. ETCHED. FIG. 4—x 500 DIAM.

ing the elastic limit (limit of proportionality) were determined, and then the different values were obtained under the Arnold, Charpy, Izod, Fremont, Sankey, and Stanton tests. The hardness was determined by both the Brinell and Shore methods; the results will be found in the following table, whilst the full details of the actual tests will be found in Appendix I:

Tensile—	
Elastic limit	15.9
Yield-point	20.9
Maximum stress	29.4
Elongation of area	30.0
Reduction of area	61.9
Alternating Impact, etc.—	
Arnold alternating-stress test	211 reversals.
Charpy impac ttest	2.9 kgm. or 20 ft.-lb.
Izod	50 ft.-lb.
Frémont	23 kgm. 90 deg.
Sankey Alternating-bend test	33 bends 2.320 ft.-lb.
Stanton repeated-blow test	635
Harness—	
Brinell hardness number..	120
Shore Scleroscope number.	20.5

It is considered that these values are of much interest. In the first place, the Arnold and Sankey tests give too good values for the steel to be considered brittle. The Charpy, Izod, and Fremont gives values which must be considered very good, therefore the steel is not brittle under the notched-bar tests. For 28 tons to 32 tons steel the tensile values must be considered quite satisfactory. Why, therefore, should this angle-iron of good composition, microstructure, and mechanical tests break with a single blow from a 14-lb. hammer? The explanation appeared to be forthcoming as a result of a careful examination of the fracture. At the point marked by the arrow there was a discoloration indicating a sharp, already-existing crack of small area. The author considers that this crack led to an undue concentration of stress, and that, in spite of the good qualities of the material, fracture extended right through the piece in the manner described. Continued observations, both in this country and abroad, have readily and finally established that the sharpness of a notch or the gradually decreasing value of the radius at the bottom of the notch, accentuates its effect in reducing the amount of energy absorbed in destroying an impact test-piece. It is now firmly established that the stresses become increasingly great locally to a notch according to its sharpness. Professor Hopkinson, in one of his papers has observed quite truly that if the bottom of the notch or crack were infinitely sharp, this concentration of stress would cause the production by a small force of a high local stress at the base of a notch or crack sufficient to exceed the strength of the material and cause a continued propagation and development of fracture. In other words, failure such as occurred in this piece of structural steel, in some of the cases of boiler plate failures and, in the author's opinion, in the St. Neots rail, have been due to existing cracks of considerable "sharpness," which have, by their creation of unduly high local stress, exaggerated abnormally the work which the material was locally called upon to do. Impact values may vary considerably in a given steel, but a high impact steel as already shown, is not impervious to disastrous failure under conditions such as those just discussed.

It will be noted in the case of this piece of structural steel just described that the Stanton value is low. In a 60-tons tensile steel values of 6,000 to 8,000 blows are obtained. In this particular instance the energy of blow was exactly the same, and the low value is explained by the low elastic limit. It will be observed that this low value (Stanton) was obtained in spite of a high notched-test value. The general argument for the utility of the notched impact (single-blow) test usually relies on the claim that through inadvertence or design, sharp corners, notches, defects, even cracks have to be counted under actual service conditions.

Surveying notched-bar, impact and "fatigue" tests generally, the author considers that one definite fact is apparent, namely, fatigue tests with notches, such as the Stanton test, do not show any relationship to the impact values. For instance, two high-tension steels of a suitable elastic limit otherwise identical, one giving 50 ft.-lb. under the Izod, whilst another gives 8 ft.-lb., will be found not to show anw disparity under Stanton test, both breaking under that form of test at something like 7,000 blows. As an instance of actual observations made, the diagram shown in Fig. 5 is instructive. There will be found the results of tests on six 60 tons to 65 tons steels. The full tensile values, together with the Stanton, Izod and Charpy values were obtained. It is clear that everything else being equal, the incipient cracking prior to rupture of the material occurring at the notch of the Stanton test-piece should, on the above argument, have been prevented from developing by the high impact value of the material, thus providing a discrimination. To the author's mind it would appear that the inference to be drawn from this and other data which will be provided later, is that once the elastic range has been passed, final rupture cannot be prevented by variations in impact value. Hence arises the fundamental importance of thoroughly considering the distribution of stress and the providing of a sufficient factor of safety in relation to elastic range.

A Discussion of the Methods Employed For Mechanical Testing

As regards the tests now in use for the mechanical testing of steels and irons, it may be safely said that each provides information of value. This may be stated without excepting any individual test. How are we to judge the relative value of the diverse means of testing from the engineers' point of view? It would appear that those tests are most instructive concerning the ultimate behaviour of the steel, which nearest approximate to, or reproduce, the conditions under which the steel has to serve. The tensile and torsion tests are of particular value, and in most cases clearly give a direct indication as to the suitability of the material. Particularly useful for purposes of design is a more complete knowledge of the elastic range under these two forms of test. Until more ready means of determining the limit of proportionality in the tensile test than the present-day extensometer can be obtained, such determinations cannot become routine tests, but the engineer might usefully obtain sufficient number of such readings to assist him in more accurately calculating his safe ranges of stress.

As regards the tensile test we have much to learn, and investigations such as those which have of late been pursued by Professor Dalby, F.R.S., are invaluable. He and other workers have advantageously shown the value of the detailed study of even our most commonly employed tests.

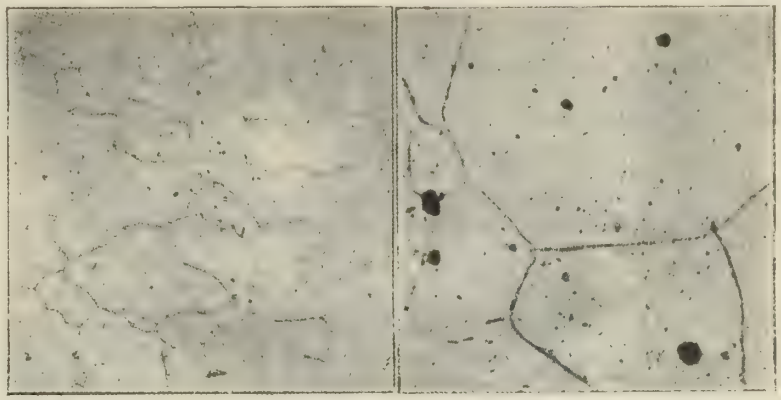


FIG. 6.—WROUGHT IRON AS RECEIVED x 100 DIAM. ETCHED x 500 DIAM.

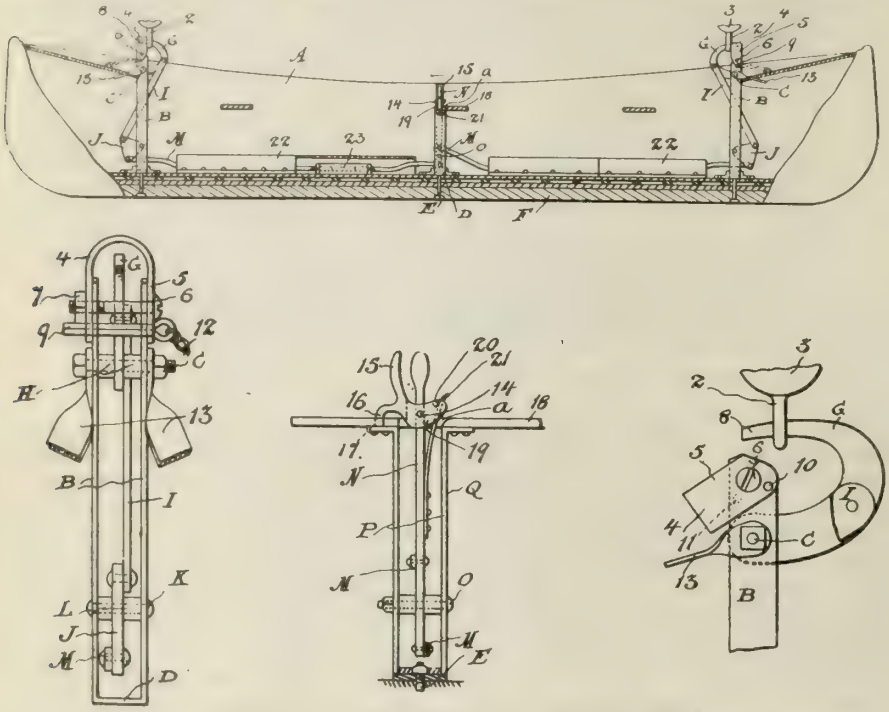
In the slang of the United States, a "dago" is any dark-skinned foreigner from Southern Europe or Spanish America, especially an Italian, a Spaniard, or a Portuguese. In his "Life of Commodore Perry" (the American naval officer who opened Japan to commerce in 1852), Dr. William Eliot Griffis says: "In Spanish America 'Santiago,' 'San Diego,' 'Iago,' and 'Diego,' are such frequently recurring vocables that the Yankee sailors call natives of these countries 'Dago men,' or 'Diegos.'"

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

PATENT BOAT FALL RELEASE

WE illustrate herewith a boat releasing device, which has been patented in the United States and Canada by Mr. John A. McNabb, 150 Shaw Street, Toronto. Mr. McNabb has been for many years an engineer on the great lakes, and has had opportunities for studying this particular apparatus, with the result that he has evolved the idea described here. The device has met with the approval of the Department of Marine and Fisheries of Canada, and the Board of Steamboat Inspectors in the United States. All the working parts of the device are constructed of bronze or other non-corrosive metal. A safety catch is provided whereby, in the event of the releasing device being jammed by ice or other unforeseen causes, the falls can be uncoupled by knocking out a pin, and swinging the safety clip clear of the hook.



ELEVATION AND DETAILS OF RELEASE GEAR

The Details

Figure 1 is a vertical central longitudinal section through a lifeboat, showing the device to use. Figure 2 is an end elevation of the coupling means. Figure 3 is an elevation of the lever for operating the uncoupling means, and figure 4 is a view of the coupling means provided with the safety device hereinafter described.

A is the boat and mounted at each end thereof is a standard B, preferably composed of two uprights spaced apart, as shown in figure 2. Pivoted to each standard is a hook 3, and these hooks are connected by links 4 to bell-crank levers 5 pivoted to said standards B. 6 is a lever pivoted at 7, in the standards 8 and 9 are connecting rods connecting the lever 6 with the ball-crank levers 5. By operating the lever 6, the hooks 3 are simultaneously opened to allow the block and tackle 10 to be uncoupled from the boat.

Pivoted to the upper end of each standard B by a pivot 11, is a keeper 12. This keeper prevents the block and tackle 10 from disengagement from the hooks 3 when the lever is in the position shown in figures 1 and 2. In case it should be impossible to open the hooks 3 from any cause whatsoever, I provide the keepers 12 and lock them in place by a safety pin 13, which passes through holes 14 and 15 formed in said keepers and standards B. By knocking out the pins 13, the keepers 12 can be moved into the position shown in figure 4, and so permit the block and tackle 10 to be unhooked from the hooks 3.

A chain 16 couples the pins 13 to the boat so that these pins will not get lost.

Each connecting rod 9 is provided with a turn-buckle 17, so as to allow for adjustment of the hooks 3 and to provide for expansion and contraction.

The connecting rods 9 pass underneath the housing or guards 18 secured to the floor of the boat.

The lever 6 is provided with a dog 19 pivoted thereto, and this dog is provided with a nose 20, which is held by a spring 21 carried by the lever 6 in a notch 22 formed in the thwart 23. The upper portion of the lever 6, as well as to lift the nose 20 out of the slot 22. formed in the side of said thwart. To unlock the lever 6 it is only necessary to lift the nose 20 out of the slot 22. Then by moving the lever 6 in the direction indicated by the arrow in figure 1, the hooks 3 will be opened simultaneously.

It will be clear now that positive means is provided to permit the block and tackle 10 to be uncoupled from the boat in case the hooks 3 should jamb.

It is also clear that a very simple means is provided to lock and unlock the lever 6, and that such locking and unlocking movement only requires one operation.

The standards B and 8 are bolted securely, as shown at 25, to the keel, and a plate 26 is secured over each nut 27 of the bolts 25, so as to lock these nuts.

Each standard B, together with its hook 3 and connected parts, are reversible, so that the device may be adapted to be installed with any type of boat.

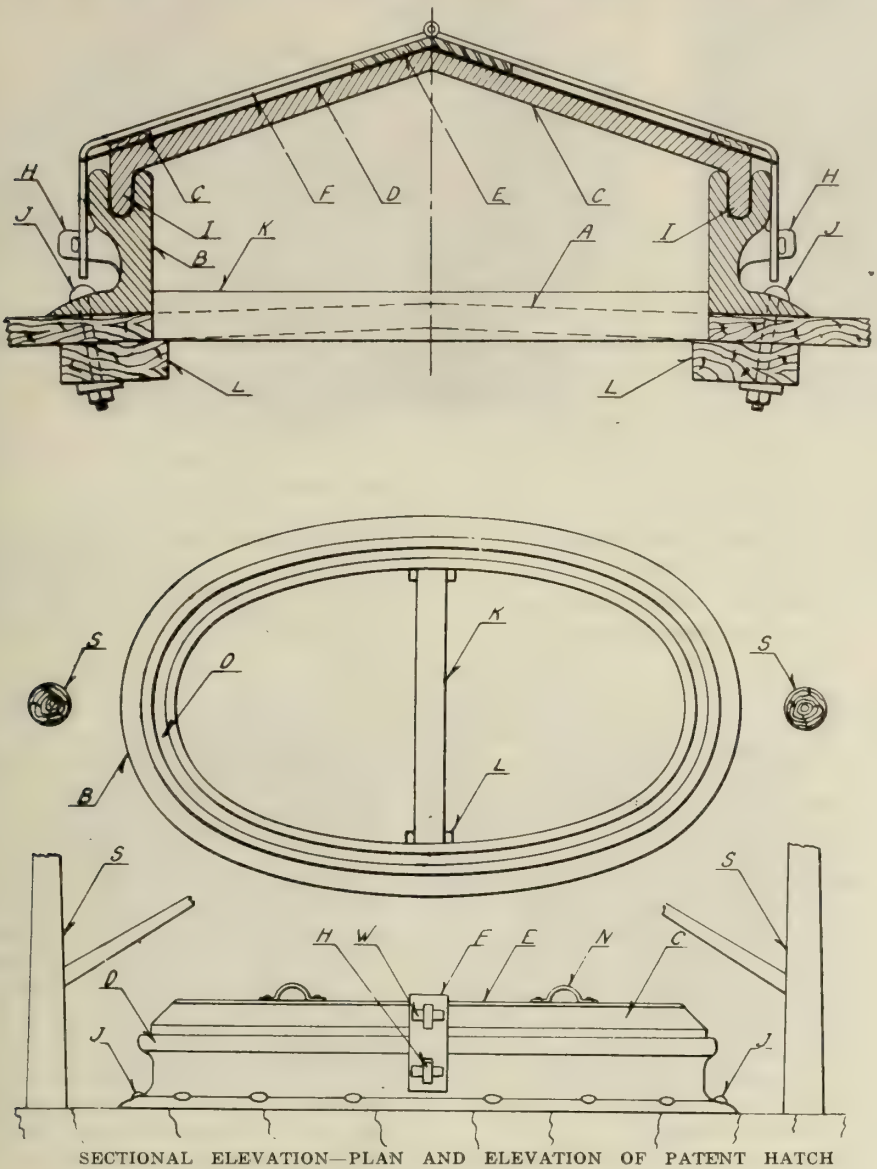
NEW DESIGN FOR SHIP HATCHES

The hatch described and illustrated herewith is the invention of Mr. K. Walsh of Port au Port, Newfoundland. As can be seen, the hatch is designed on a totally different principle to the usual style, in that it is of elliptical shape instead of the usual square. The method of fitting and securing the hatch cover is quite new.

Referring to the illustration B is the hatch coaming, bolted or riveted to the deck by bolts or rivets J. At the top of the coaming is formed the groove I, which receives the flange or spigot of the cover D, making a perfectly watertight joint. The cover itself is made in two halves, jointed at the top, and a strap F is fitted over the joint, the ends being secured over lug H by wooden wedges W. A continuous angle E runs round the top of the cover, to stiffen it, and rings N are fitted for shipping and unshipping the cover. The posts S shown at the side of the hatch are for the same purpose, the hatch, when off, being supported in a chock at the foot of the post, and held up by a loose hook fitted on post, but not shown in drawing.

Mr. Walsh claims for this hatch that it is watertight, incapable of being crushed by heavy seas, and likewise proof against being burst off. It requires no tarpaulins to keep it watertight, and needs no strong backs in the hold to support it. There are no flat

surfaces or square ends for the seas to get a purchase on. A gas or air vent is provided at the apex of the hatch cover. The hatch can be fitted fore and aft or thwart ship.



SECTIONAL ELEVATION—PLAN AND ELEVATION OF PATENT HATCH

THE ROLLWAY PUMP

The "Rollway" pump described below is manufactured and offered to the trade by the Michigan Machine Co., Detroit, Mich.

It was developed by two engineers of one of the largest motor plants in the world who found that from maintenance standpoint geared, centrifugal and wing pumps were entirely too expensive when compared to the cost of maintenance of machine tools and other accessories. Not only was their efficient life very short, but the centrifugal could not be used to advantage on all machines on account of its limited suction powers and lack of pressure and not at all on most machines where oil was used. On the other hand the geared and wing pumps gave very short service on water solutions and the necessity of using check valves on all installations restricted the flow. Loss of prime, clogging, etc., were every-day occurrences.

Then, too, these conditions made it necessary to carry their repair parts for innumerable types of pumps and they found trouble in finding mechanics who were sufficiently familiar with all types of pumps to keep them in proper condition. Determined to remedy this condition these two engineers conducted a series of experiments extending over a period of two years and the "Rollway" pump was the result.

The principal thought involved in designing was the elimination of such troubles as loss of prime, clogging, inadequate suction, short life. These pumps have now been in use for more than a year and have been found to possess the necessary qualities coupled with many other advantages.

The accompanying cut shows the extreme simplicity of the "Rollway." Its principal working parts consist of two rollers, which rotate eccentrically in the pump chamber. The entire motion is rolling, eliminating all wear, which in other pumps is caused by scraping of working parts against the pump chamber. The "Rollway" will do anything that either the geared, wing or centrifugal pump will accomplish. It will do it at slower speeds and do it with less trouble and keep on doing it longer.

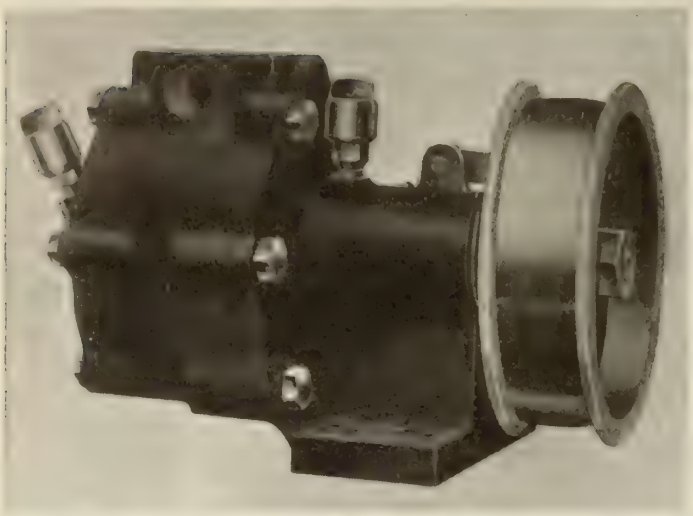
The "Rollway" pump is unique in that, though a positive pump, it possesses the following qualities. It is self priming, may be used anywhere within 10 feet above the level of the liquid and will prime itself, requiring no valves. This positive suction is not affected by aeration, as is the case with other pumps. The tank from which the liquid is being pumped may be entirely emptied and the pump allowed to suck air; when the tank is refilled the "Rollway" will immediately start pumping again.

No relief valves or overflow piping are required. The outlet in the discharge piping may be closed and the pump allowed to run without damaging pump or piping. This result is obtained by use of a spring placed in the rectangular slot in the inner roller which bears against the squared shaft. This spring operates only when the pressure on the pump is as great as the pressure required to compress the spring. When the pressure is reached the compression of the spring allows the rollers to come to the centre of the pump, where they continue to revolve in the liquid without exerting further pressure on it. The fact that the spring operates only under this condition and one other described in the following paragraph assures a remarkably long life to the spring.

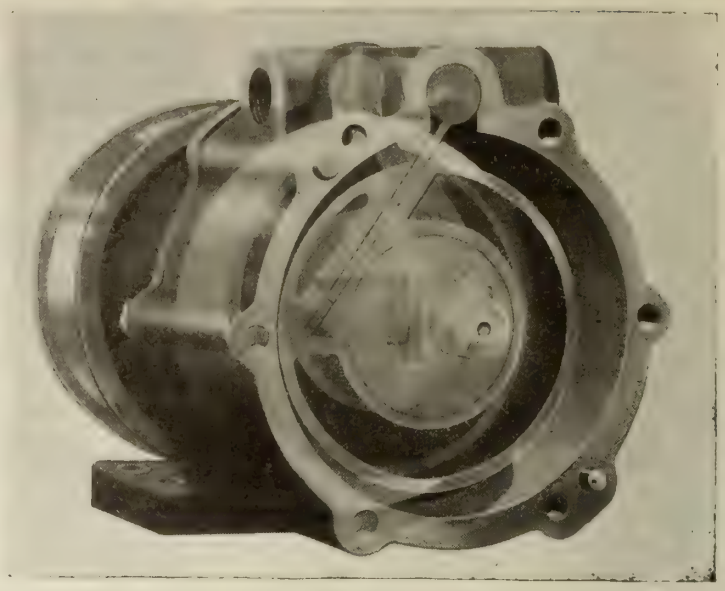
The "Rollway" is not affected by foreign matter in the liquid and will not clog. Anything such as cast iron and steel ships, paper, rags, waste, etc., which can pass through the intake pipe will pass through the pump without clogging or damaging it in any way, because the action of the pump is to roll the liquid in front of the pump rotor. Should a chip stick, the spring described in the preceding paragraph will compress, allowing the roller to pass over the obstacle without damaging the pump, and it will be washed out on the next revolution of the motor.

The "Rollway" pump is truly universal. It may be used upside down or right side up and at any point on a machine where its application is most convenient. Either side of pump may be used as intake or outlet. Plain pumps may be used on reversing machine, where no liquid is required when the machine is reversing. The pump can be reversed without harming it and it will deliver liquid again immediately its proper direction of rotation is resumed. A pump equipped with reverse valves will be furnished where it is necessary to maintain a constant flow in a given direction regardless of the direction of rotation of the pulley.

As far as the efficient operation of the "Rollway" is concerned, speed is not a factor. It may be operated at speeds ranging from 100 to 600 r.p.m., or more, making it more applicable to all types of machines without extra expense of making special provision for either high



OUTSIDE VIEW OF PUMP



PHANTOM VIEW OF PUMP

or low speeds in order to secure maximum efficiency. The fact that the "Rollway" may be operated at very low speeds, however, insures very long life, and where this low speed can be obtained advantage can be taken of this feature.

The "Rollway" permits real pump standardization throughout all factories eliminating the present necessity of using numerous sizes, makes and types of pumps in order to obtain maximum efficiency on various types of machines and eliminating the necessity of carrying repair parts for a dozen different types of pumps. It makes no difference to the "Rollway" whether your requirements call for oil or water—it's as efficient on one as the other. It requres less horse-power per gallon of liquid pumped than any other pump manufactured. In factories where many pumps are used this is a factor that will mean a saving of many dollars per year.

The following tests were made with ¾ in. pump, which has been in use pumping dirty, gritty compound for several months.

Fifty feet of garden hose was attached to intake and outlet of pump and this should be borne in mind when reading the following figures) as the resistance of sucking and discharging through 100 feet of hose is far greater than if pipe had been used.

At a suction lift of 7 ft. (seven feet) the pump primed itself almost instantaneously, operating at 160 r.p.m.

At a suction lift of 8 ft. 6 in. (eight feet, six inches) it primed itself almost instantaneously at 360 r.p.m.

The same results were obtained on a 10 ft. (ten foot) suction at 430 r.p.m.

The end of the fifty foot suction hose was placed in a barrel on the elevator at the third floor, the pump started, and the elevator lowered to the bottom of the elevator pit, a distance of 40 feet, and the pump continued to produce a good full ¾ in. stream of water.

The ¾ in. pump showed the following capacities with 36 in. suction.

7½ gallons at 160 r.p.m.
11 gallons at 360 r.p.m.
15 gallons at 500 r.p.m.
20 gallons at 650 r.p.m.

Standard pumps are furnished with controlling spring to develop 25 lb. pressure at 200 r.p.m. 40 lb. pressure at 420 r.p.m., etc.

Pump can be furnished with springs to develop either higher or lower pressure, as may be required, or without springs where very high pressures are required. At present the only sizes available for immediate delivery are: ½ in. and ¾ in. intake and outlet, but will soon be available in sizes ranging from ¼ in. to 2 in. intake and outlet. It will also be furnished with reverse valves, so that a constant flow of liquid in one direction can be had regardless of the direction of rotation of pulley.

The pump is recommended for use in the following places:

Machine tools for force feed lubricaculation.

Machine tools for force feed lubrication of bearings.

Auto engines for oil circulation.

Tractor engines for water and oil circulation.

Marine engines for water and oil circulation.

Fuel oil systems of all kinds.

Fire engines.

Brine circulation.

Refrigerating systems.

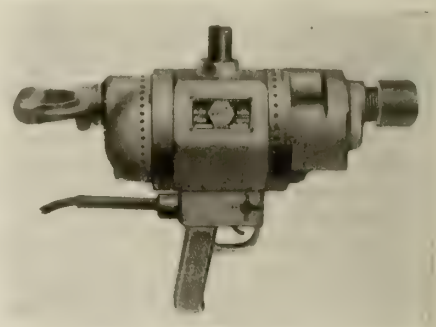
Gas and oil service stations.

Automatic water system.

Farm use, etc.

BLACK & DECKER ELECTRIC DRILL

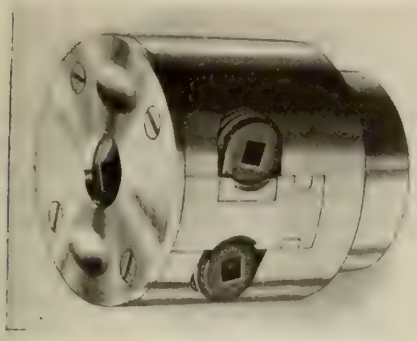
The Black and Decker Manufacturing Company, 105-115 South Calvert St., Baltimore, Md., has recently added a new size to its line of portable electric drills. The new machine is shown in the illustration, and has a capacity up to 9-16 in. in steel, and is provided with a No. 1 Morse taper socket. It is stated the machine will drill a 9-16-in. hole through machine steel at rate of 1½ in. per min. without overloading the motor. The housing is of Magnalite, an aluminum alloy. The gears are packed in grease in a separate grease-tight compartment, and the drill spindle runs in a long bronze bushing, thrust being taken by a ball-thrust bearing. The motor is air cooled and will run continuously without overheating. The Morse taper socket is in the form of a separable sleeve secured in the drill spindle by means of a large knurled nut. By unscrewing this nut the entire taper socket is easily removed from the spindle. The drill shank protrudes slightly beyond the end of the taper socket, in order that the drill may be removed. This construction is used, for if it was necessary to leave room for the drift-pin slot the machine would be considerably less compact, and the end of the spindle would be some distance from the bearing. The machine has the customary pistol grip and trigger switch, which characterize Black & Decker drills. The machine weighs 21 lb., has a no-load speed of 600 r.p.m. and is supplied with interchangeable spade handle and breastplate, as well as electric connecting cable.



GENERAL VIEW OF DRILL.

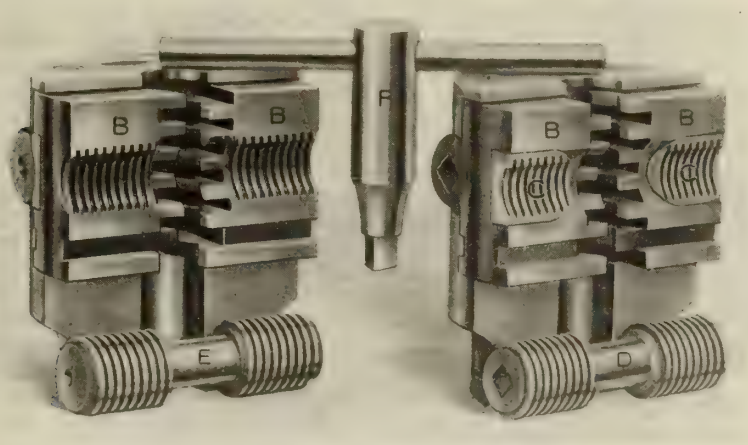
MARVIN & CASLER DRILL CHUCK

In the accompanying illustarations is shown the Casler twin screw drill chuck, which is a recent product of the Marvin & Casler Co., Canastota, N.Y.



GENERAL VIEW OF THE CHUCK.

The body of this chuck is made of close-grained cast iron, and jaws and screws are of tempered high-carbon steel. The claim is made that the combination of cast iron and steel gives long life to the wearing surfaces between the body, jaws, and screws. It will be seen that the body is reinforced by a steel cap plate, which



SECTION THROUGH THE CHUCK.

prevents it from spreading when under strain; and a secondary screw doubles the grip of the drill chuck jaws and allows the drill to be driven to the limit of its strength. When using the chuck, the primary screw E, Fig. 2, is first operated to grip the drill shank between the jaws, and after this primary screw has been set up, the secondary screw D is operated to bring the floating nuts C against the ends of the pockets in the jaws B. The tightening of this secondary screw D results in producing a grip on the drill shank that is claimed to be twice as great as that obtained from a single screw. All parts of the chuck are made interchangeable to facilitate replacement, and there are no projections likely to catch the work or injure the operator.

NEWTON CENTERING MACHINE

The newly designed centering machine, illustrated and described herewith, is a recent development of the Newton Machine Tool Works, Philadelphia, U.S.A., for centering rough and irregular forgings.

Two universal centering vises of the interlocking type are supplied with the machine. The jaws are adjustable by means of a screw giving a capacity for rounds from 2 in. to 12 in. in diameter and of any desired length.

Vices are adjustable on the bed by means of rack and pinion.

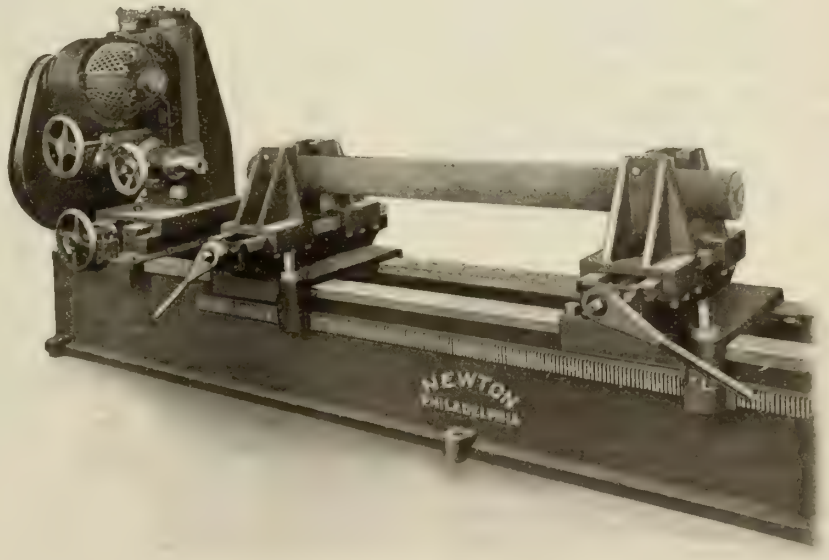
The spindle is of forged steel, 3 in. in diameter, running in bronze bushed bearings, has 4 in. cross and 4 in. of vertical adjustment, with 8 in. of hand feed.

The cross and vertical adjustments are equally divided from centre line of work.

The drive is by direct connected motor through a bronze driving gear.

Alignment of all adjustable parts is maintained by adjustable taper shoes.

Table of dimensions: diameter of spindle, 3 in.; in-and-out adjustment of spindle, 8 in.; vertical adjustment to spindle, 4 in.; cross adjustment to spindle, 1 in.; length of base, 16 ft.; width of base, 22 in.; distance centre of vise to top of base, 15½ in.; maximum distance centre of spindle to top of base, 17½ in.; minimum distance centre to spindle to top of base, 13½ in.



GENERAL VIEW OF THE MACHINE.

Naval Architects' Data, published by Longmans, Green and Co., is a useful volume for the naval architect, engineer, or shipyard manager to have in his possession. The book is by J. Mitchell, edited by Edward L. Atwood, and contains a chapter on formulae and approximations for ship design. Tchebycheff's Rule, Simpson's Rules, and all the usual data for making preliminary calculations are given. The following pages of the book are devoted to data sheets, with all the necessary particulars printed in and a space left opposite each to fill in the necessary figures. Data for any ship or number of ships of the same class can be kept in this book, which would then form a valuable ready-reference for any type of vessel under consideration at the moment. The book is published at $3.

The All-Way Oiler Manufacturing Co., of Toronto, have placed on the market various oiler devices well worthy of investigation. The All-Way oiler is applicable to oil guns, combination filler and funnel, and the All-Way oil can.

Briefly, the oiler is the regular type of can fitted with flexible steel spout, made to bend in any desired angle or position without breaking or interfering with the flowing of the oil. There is no waste of oil when using this type of oiler, as the spout always reaches the desired spot.

At the end of spout a cleaning device is installed, which merely takes a second to operate. This same device also prevents oil from flowing too freely, thereby wasting.

The complete oiler is strongly made of copper-plated steel in different sizes.

Mr. H. Obee is manager of this concern handling these very useful lines.

One way to save time and eye strain is to prepare a large chart in the form of a stenciled board. This is made large enough for figures to be easily read from any part of the stock-room.

The New Moffat Electric Steel Furnace

Features of Design Which Make For Economy in Operation and Refractory Endurance Are Incorporated—The Arrangement of Electrodes is Also of Interest

By W. F. SUTHERLAND

RECENT developments in the smelting of iron ores by a duplex process employing the electric furnace as the final step for the melting of sponge have been described recently by Mr. J. W. Moffat. While the electric furnace which will be used in this duplex process may be of any type, it is of interest to note that Mr. Moffat has developed a design for the refining of steel which is capable of very economical operation.

In some respects this electric furnace resembles the three-phase types now in common use, the three electrodes projecting into the bath from above. Usually in such furnaces, however, the refractory lining of the walls and the shell are circular in shape, and the electrodes are arranged one at each angle of an equilateral triangle equidistant from the walls.

In the operation of such furnaces trouble is frequently encountered by reason of the crescent-shaped masses of partially fused raw material found clinging to the walls between the electrodes, this material being thickest at the point midway between any two electrodes. These masses are often difficult to get into the bath, as in their partially fused state they adhere to the colder wall of the furnace. In endeavoring to remove them by mechanical means, injury is often done to the lining of the furnace, portions being carried away and into the bath.

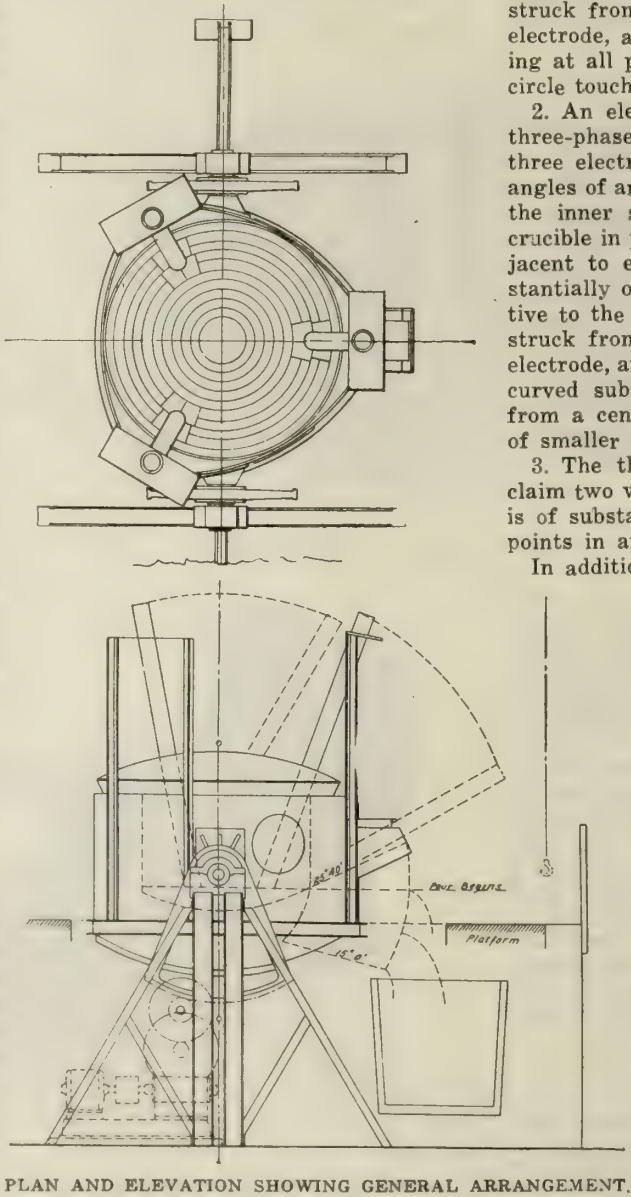
The more usual practice is to increase the input of electrical energy and to melt off the partially fused material. This procedure, however, increases the length of time for the manufacuring of the steel, often as much as one-half hour in a heat which should be taken off in about four hours, and means an increased cost amounting to 12 to 15%. The practice is also objectionable, as it leads to overheating the already fused material in the bath, and also to the overheating of the furnace walls nearest the electrodes.

New Design

In the design developed by Mr. Moffat, for which patents have been recently issued, these difficulties in operation have been overcome by shaping the body to conform to the lines of current flow in the bath of molten metal. The characteristics of current flow in a flat plate or an approximation thereto are well known, and the current is distributed throughout the metal, the lines of equal current density being in the form of current arcs from pole to pole.

The shape of the walls is well illustrated in the accompanying diagrams, and it will be seen that the walls are brought inward between electrodes in such a fashion that no cold spot occurs, and the growth of partially fused nodules of metal avoided. In other words, the furnace walls are so shaped as to conform to the isothermal lines of temperature in the furnace.

It is also found that to secure the best results in wall life, that the wall itself should be of equal thickness at all points in any horizontal plane, and by so arranging it, the radiation is the same at all points, thus rendering it impossible for any one point of the inner lining to become heated to a higher temperature than other parts of the same wall. In this way the overheating of portions of the wall is avoided, and one of the most fruitful causes of short refractory life avoided.



PLAN AND ELEVATION SHOWING GENERAL ARRANGEMENT.

The claims made for this furnace in the patent specifications, are of interest, and are given below.

1. An electric furnace, operating with three-phase current, and provided with three electrodes arranged in plan at the angles of an equilateral triangle, in which the inner surface of the wall of the crucible in plan is shaped as follows: Adjacent to each electrode curved substantially on an arc of small radius relative to the spacing of the electrodes and struck from a centre in the axis of the electrode, and between the electrodes lying at all points within a circumscribing circle touching each of the arcs.

2. An electric furnace, operating with three-phase current and provided with three electrodes arranged in plan at the angles of an equilateral triangle, in which the inner surface of the wall of the crucible in plan is shaped as follows: Adjacent to each electrode curved substantially on an arc of small radius relative to the spacing of the electrodes and struck from a centre in the axis of the electrode, and between any two electrodes curved substantially on an arc struck from a centre adjacent the opposite arc of smaller radius.

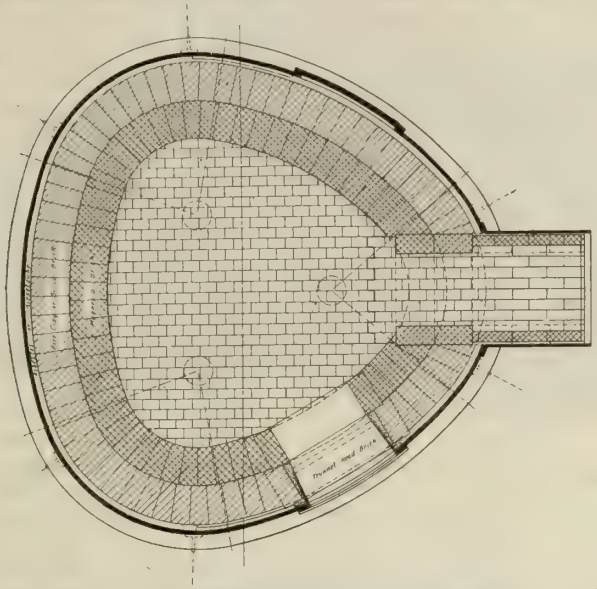
3. The third claim is a repetition of claim two with the addition that the wall is of substantially equal thickness at all points in any horizontal plane.

In addition to the above operating advantages, the shape lends itself to the securing of a number of other important advantages. The lining is built up entirely of key and wedge bricks. This results in their being held rigidly in place relative to one another, and they are, in consequence, unable to work inwards to the open space of the bath. The bottom is an inverted arch formed with an outer lining of arch brick, silica or fire-brick, and an inner lining of magnesia key brick on top of which may be placed another course like that last, or a burnt-in bottom of grain magnesite may be used of equal thickness.

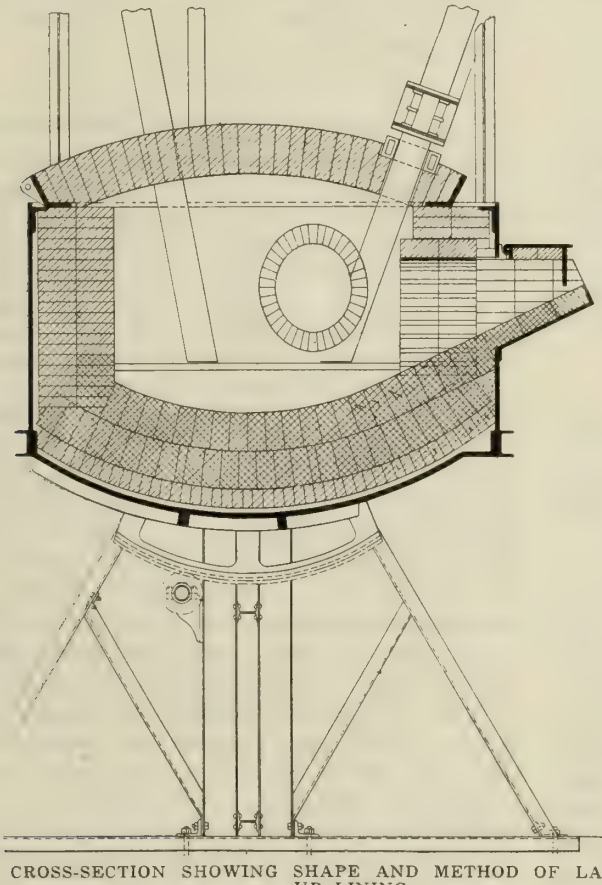
If the operator in taking a heat is careless and not watching his slag, there is no fear of a run-out caused by a brick floating up, as they are all keyed.

The Roof

When the furnace requires a new roof it can readily be placed in position with the aid of a crane in about one-half hour, owing to the convenient arrangement of the electrode guides.



SECTIONAL PLAN SHOWING SHAPE AND METHOD OF LAYING UP LINING.



CROSS-SECTION SHOWING SHAPE AND METHOD OF LAYING UP LINING.

On each electrode two upright guides are spaced equidistant from the electrode opening in the roof. At the top of these uprights the guides pass downward at an angle of 70°, and are fastened to the roof cooling casting inserted in a gain made in the roof brick around the electrode opening. These guides are hinged at the top of the uprights.

When a new roof is to be placed in position two bolts are loosened, and after the electrode has been raised to clear the roof all that is required is to lift the roof cooling casting about two inches, enough to clear the gain in the roof, and the whole assembly can be swung out of the way of the old roof being taken off and the new one being placed in position.

SCIENTIFIC RESEARCH

The Special Committee on Scientific Research deserves and requires generous encouragement and financial support from the Government. Under the sanction of the Research Council Act of 1917, and by means of the Honorary Advisory Council for scientific and industrial research a survey of the field has been made. Time has come when further steps must be taken and additional financial support be available if Canada is to keep pace and make a proper use of its assets.

We have no institution corresponding to the Bureau of Standards at Washington, so are dependent on U. S. and other countries for information and guidance in matters which vitally concern her industries. The committee recommends the establishment of a Dominion Bureau of Standards. Concerted and continued efforts should be made to place before the people the facts concerning scientific research and the advantages of national support thereof. The committee does not feel they have had sufficient time to digest evidence and so forth to make definite suggestions, and asks to be reappointed as early as possible next session to give the matter further consideration. They ask that their proceedings be printed for distribution and be put in the sessional journals.

There are, for instance, 1,500 square miles of tar sands in Northern Alberta near Port McMurray in a stratum from four to ten feet thick, and the tar in the deposit ranges in concentration from ten to eighty per cent. The tar sand was used to pave a street in Edmonton, which pavement has been in satisfactory use for five or six years. The quantity of sand mixed with the tar is a handicap, as, if transported long distances, the sand would be a serious factor in the freight charges. A grant was made to determine a cheap method of separating the tar from the sand on a large scale, but, owing to the impossibility of finding scientific and specially qualified engineering experts, nothing has yet been done.

The motor cycle has found use in a Hawaiian sugar factory as a heavy hauling unit or baby tractor. Four and a half tons can be hauled distributed over four cars.

In some anti-aircraft shells use is made of the bow wave of compressed air which is present on projectiles travelling at a sufficient velocity. In flight the striker of the fuse rides or floats on this bow wave and absolutely nothing else keeps it off the primer. The instant an obstruction, no matter how light, is encountered, the wave disappears and the striker jambs back on the primer, exploding the shell. These fuses will explode on your silk handkerchief not to mention airplane and balloon fabrics.

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COLUMBIA MEANS TO RULE THE SEAS

THE United States Shipping Board have announced the projected building of two mammoth liners, which will make the possessions of other nations in this class of vessel look like the proverbial thirty cents.

These vessels are to be 1,000 feet long, with a steaming speed of thirty knots, accommodation for three thousand passengers and one thousand crew. They will develop 100,000 H.P., with oil fuel, and their cruising radius at full speed will be about 6,000 miles, enabling them to make the round trip from New York to a United Kingdom port and return without having to replenish their fuel tanks. In case the United States should again forsake the profitable paths of peace they will be fitted with gun emplacements. It is proposed to build a terminal port at Montauk Point, about 120 miles from New York, to accommodate these super liners.

The United States is a wealthy nation, and can afford to have such luxuries as these vessels will undoubtedly be. The cost of construction of these vessels will be enormous, and the cost of operating them will be such as to make them impossible to operate as a commercial venture. Probably the capital cost will be written off, thus enabling them to compete with the ordinary liner for passenger traffic. The tendency in Great Britain, where they have had some experience with the fast passenger liner, is to let this class of ship strictly alone, and to build the intermediate type of liner of moderate speed, and a fair amount of cargo carrying capacity. There are other problems to consider with vessels of the size under consideration by the Shipping Board, connected with such practical necessities as draught of water and docking facilities. However, now that Uncle Sam has acquired a mercantile marine, he is determined to have the biggest thing that can be used or built.

LLOYD'S REGISTER RETURNS

IN another part of this issue will be found the returns of shipbuilding for the quarter ending June 30th, which includes the whole world, with the exception of Germany, for which figures are not yet available. The situation in Great Britain is much better than in previous statements, and it would seem that if the present rate would be maintained the figures would reach 2,000,000, tons for the year 1919. However, they may fall short of this, for the temper of the workers in the Old Country is so uncertain, that strikes and tie-ups are liable to happen at any moment. The gross tonnage of vessels building in the United Kingdom is 2,524,050, including steam and sail, and in all other countries excluding Germany, 5,493,717. Of the vessels under construction abroad there were at the end of June, in Canada and the other British Dominions a total of 346,453 gross tons, in which are represented 209 vessels, steam, sail and motor. Japan had 682,060 gross tons, and the United States 3,874,143. These represent vessels laid down, but do not make any reference to the number of ships actually delivered, which is perhaps the more important point. The increase of shipbuilding in the United Kingdom over the same quarter of 1918, is 709,000 tons, and over the previous quarter of this year, 269,000 tons. These figures are encouraging and look as though the industry was getting into its stride. There is another hopeful feature in that the great bulk of repairs which were necessary will be getting reduced, thus freeing more men and tolls for the building of new tonnage. It is significant that the ferro-concrete construction is represented by only 28 barges of a total tonnage of 19,608, and 10 motor vessels of 2,256 total tonnage. These figures will be disappointing to those who a short time ago were prophesying the disappearance of the steel ship in favor of concrete.



Educational Items for Future Officers

A Series of Questions and Answers on Subjects Pertaining to Seamanship—Rule of the Road—The Use of the Chart—These Articles Will Appear Monthly

Continued from last month's issue.

SHIP'S BUSINESS
MASTERS' DUTIES WHEN TAKING COMMAND

Que.—What is the first thing you would do on being appointed master?

Ans.—Get the ship's REGISTER, take it to the custom house, have my name, date of appointment, and number of certificate put on the back, then go on board and take charge.

Que.—What might be necessary for you to do in a strange port?

Ans.—Get some one to identify me at the custom house.

Que.—What particulars would a master have to attend to should his vessel be loaded ready for sea when he takes charge?

Ans.—First, see she is properly loaded, get the ARTICLES, sign on the crew, seeing the officers had certificates qualifying them for the positions they hold on board, take the necessary PAPERS, go to the custom house, CLEAR the ship, then get on board and proceed on the voyage or trip.

Que.—What PAPERS would you take to the custom house to clear your ship?

Ans.—SHIP'S REGISTER, ARTICLES, last CLEARING BILL, MANIFEST OR BILLS OF LADING, also officer's certificates.

Que.—What would you be careful about when signing on a crew?

Ans.—Be sure to READ the ARTICLES over before the crew signs, also see they are properly WITNESSED.

Que.—By whom would you have your ARTICLES witnessed?

Ans.—By a COLLECTOR of CUSTOMS or SHIPPING MASTER.

Que.—What would it be necessary for you to do leaving port?

Ans.—In twenty-four hours after leaving, there should be a COPY of the ARTICLES posted up in some conspicuous place where the crew could have access to them at any time they required.

SHIP'S BUSINESS

Que.—What is a ship's REGISTER?

Ans.—A CERTIFICATE showing the ship has been PROPERLY REGISTERED by LAW.

Que.—What is contained in it?

Ans.—The ship's name, her port of register, full details of ship and her tonnage, also the REGISTERED OWNER'S NAME.

Que.—What does the MASTER use the ship's register for?

Ans.—As an authority for being in command.

CHARTER PARTY

Que.—What is a CHARTER PARTY?

Ans.—An AGREEMENT for letting the whole, or part of the VESSEL to FREIGHT for one or more voyages, or a length of time.

Que.—By whom is it drawn up?

Ans.—The OWNER and MERCHANT AT HOME, or the MASTER or AGENT may do so in a foreign PORT.

Que.—What does the OWNER agree to do in a CHARTER PARTY?

Ans.—He agrees to find a ship, GOOD, SOUND, and STAUNCH in every way equipped for the VOYAGE.

Que.—What does the MERCHANT AGREE to do?

Ans.—He agrees to FIND CARGO and PAY THE FREIGHT.

Que.—When would the CHARTER PARTY be completed?

Ans.—When it is SEALED, STAMPED and SIGNED, by the CONTRACTING PARTIES before WITNESSES.

Que.—How many WITNESSES should be required?

Ans.—If the CONTRACTING PARTIES both SIGNED at the same time, ONE WITNESS would be required, if they SIGNED AT DIFFERENT TIMES, ONE WITNESS would be required for each SIGNATURE.

Que.—Name some of the PRINCIPAL CLAUSES in a CHARTER PARTY?

Ans.—The NATURE OF THE INTENDED VOYAGE,

FREIGHT and how it is to be PAID, LAY DAYS and DEMURRAGE DAYS, if any, also the PENALTY for not PERFORMING the CONTRACT.

Que.—What do you mean by the nature of the intended voyage?

Ans.—The ROUTE the vessel is to take, and the PORTS she is to call at.

Que.—How would you have the FREIGHT PAID?

Ans.—Half when the ship is loaded, the other half when she arrives at her destination.

Que.—What is the PENALTY for NOT PERFORMING the CONTRACT?

Ans.—Generally the amount of the FREIGHT, sometimes a STIPULATED SUM.

Que.—What is the EXCEPTIONAL CLAUSE IN A CHARTER PARTY?

Ans.—The act of GOD, king's enemies, restraints of PRINCES AND RULERS, PIRATES, FIRE, and all and every other DANGERS or ACCIDENTS, of the SEAS, RIVERS, and NAVIGATION, also ACCIDENTS to MACHINERY and BOILERS.

Que.—What does the "AFLOAT CLAUSE" mean in the Charter Party?

Ans.—It gives the master liberty to keep his VESSEL AFLOAT while LOADING OR DISCHARGING.

Que.—Why do we sometimes insert an ICE CLAUSE in the Charter Party?

Ans.—So that the ship shall have the liberty to proceed with what cargo she has on board if likely to be FROZEN in before completing her LOAD.

LAY DAYS

Que.—What are LAY DAYS?

Ans.—The number of days specified in the CHARTER for LOADING and DISCHARGING.

Que.—When would LAY DAYS commence?

Ans.—TWENTY-FOUR HOURS after the ship has been entered in the CUSTOM HOUSE and the MERCHANT has been notified in WRITING that the ship is ready to load or unload.

Que.—How would you insert LAY DAYS in a CHARTER PARTY?

Ans.—Either as RUNNING DAYS or WORKING DAYS.

Que.—What is meant by RUNNING DAYS?

Ans.—Every day counts.

Que.—What is WORKING DAYS?

Ans.—It means you must except SUNDAYS and HOLIDAYS.

Que.—If your LAY DAYS were about up what would you do?

Ans.—TWENTY-FOUR HOURS before they EXPIRED I would notify the MERCHANT in writing that the SHIP would be on DEMURRAGE next day, entering a COPY of the LETTER in the LOG BOOK, the CHIEF OFFICER and myself to sign it.

DEVIATION

(Cont. from last issue)

Que.—How would you account for the DEVIATION CHANGING when going from ONE LATITUDE to ANOTHER or by going in a NORTH or SOUTH direction?

Ans.—THE DIRECTIVE FORCE would CHANGE the POSITION of the POLES in the SOFT IRON, as the SHIP goes NORTH or SOUTH, as at the MAGNETIC EQUATOR the DIRECTIVE FORCE is HORIZONTAL, causing the NORTH and SOUTH poles to be so close together, the ONE NEUTRALIZES the OTHER and would have no power to DEFLECT the COMPASS NEEDLE, at the magnetic poles the DIRECTIVE FORCE is VERTICAL, causing the NORTH and SOUTH POLES to be in the EXTREME ENDS of VERTICAL SOFT IRON, giving it the GREATEST AMOUNT of DEFLECTIVE POWER, so we see there is a continual CHANGE going on as the ship RECEDES from or to the MAGNETIC EQUATOR, and we must look for a CHANGE in the DEVIATION.

Que.—Would DEVIATION be the same on all points on the COMPASS?

Ans.—No, it would be DIFFERENT on DIFFERENT POINTS.

Que.—Why?

Ans.—THE IRON in the ship would have DIFFERENT effects on the NEEDLE as the ship is TURNED in AZIMUTH.

Que.—Would deviation be the same all over the chart?

Ans.—Deviation has nothing to do with the chart?

Que.—How do you correct deviation?

Ans.—By placing MAGNETS round the compass.

Que.—If you found an error on NORTH or SOUTH how would you place the MAGNET to correct it?

Ans.—If caused by continuous athwartship iron it should be placed ATHWARTSHIPS either on the fore or aft side of the BINNACLE.

Que.—If you found an error on EAST or WEST how would you place a MAGNET to correct it?

Ans.—If caused by continuous FORE and AFT iron it should be placed FORE and AFT on the STARBOARD or PORT side of the BINNACLE.

Que.—How would you correct an error found on the QUADRANTAL POINTS?

Ans.—If caused by continuous ATHWARTSHIP or continuous FORE and AFT IRON, by PLACING SOFT IRON GLOBES, ONE on each side of the BINNACLE, in the CENTRE line of the card.

Que.—How is the heeling error corrected?

Ans.—By placing a MAGNET VERTICAL underneath the CENTRE of the COMPASS.

Que.—How is a VERTICAL ERROR CORRECTED?

Ans.—By placing a SOFT IRON BAR, VERTICALLY on the forward or after side of the BINNACLE.

METHOD OF FINDING THE AMOUNT OF DEVIATION

Que.—How could you find the AMOUNT of DEVIATION of your COMPASS?

Ans.—By placing the ship's head in line with TWO POINTS of land or lights, the MAGNETIC BEARING being known, or during the day, by bearings of the sun, or at night by bearings of the moon or stars, or by RECIPROCAL BEARINGS.

Que.—How could you tell the AMOUNT of DEVIATION by BEARINGS of TWO LIGHTS or POINTS of LAND, the MAGNETIC BEARINGS being known?

Ans.—When they are in range, place the ship's head in line with them, the difference between the MAGNETIC BEARING and the COMPASS BEARING would be the amount of DEVIATION.

Que.—When would the DEVIATION be EASTERLY, and when WESTERLY?

Ans.—If the COMPASS CARD is drawn to the right it would be EASTERLY, if to the left WESTERLY. For an illustration take TWO POINTS or LIGHTS, MAGNETIC BEARING N.W. When in range place the ship's head in line with them, the COMPASS shows N.W. ½ W. If there is no deviation, your compass would show N.W., but in this case the N.W. point of the card is drawn to the RIGHT ½ a point, leaving ½ a point of EASTERLY DEVIATION, just the same as if we look at our CHART and see the MAGNET NEEDLE placed to the left of TRUE NORTH, call it WESTERLY DEVIATION, because the COMPASS NEEDLE is drawn to the LEFT, and EASTERLY when drawn to the RIGHT.

Que.—How would you apply this DEVIATION to your COURSE or BEARING?

Ans.—If you find you have to make a COURSE in N.W. MAGNETIC you would have to steer N.W. ½ W. by your COMPASS which would be allowing for your EASTERLY DEVIATION to the LEFT. After a while you see a light bearing N.W. ½ W. by your COMPASS, you will readily see it must be laid off on the CHART N.W., which would be allowing the EASTERLY DEVIA-

TION to the RIGHT, WESTERLY would be applied the opposite.

Que.—How would you find the deviation by bearings of the sun?

Ans.—First correct the time for ship's longitude, allowing the EQUATION of time for the day of the month, to get APPARENT or SUN TIME, then take the DECLINATION for the day of the month, and LATITUDE of the ship, turn up in BURDWOOD'S or other TABLES for the same purpose, get the SUN'S TRUE BEARING, take a bearing of the SUN by the COMPASS, and the DIFFERENCE between them will be the ERROR; allow for the VARIATION and the remainder will be the DEVIATION.

Que.—When would the ERROR BE EASTERLY and when WESTERLY?

Ans.—If the true bearing is to the RIGHT of the COMPASS bearing the ERROR is EASTERLY, if to the LEFT, WESTERLY, or as in naming the DEVIATION, if the COMPASS is drawn to the RIGHT, ERROR is EASTERLY, if to the LEFT, WESTERLY.

Que.—Then how could you find the DEVIATION?

Ans.—If the ERROR and VARIATION are both EASTERLY, or both WESTERLY, their DIFERENCE would be the amount of DEVIATION, if one is EASTERLY and the other WESTERLY, add them together to get the AMOUNT of DEVIATION.

Que.—How would you name the DEVIATION?

Ans.—The deviation will always take the same name as the ERROR, unless they have to be subtracted, and the VARIATION is greater than the ERROR, in this case only the Deviation takes the opposite name to the error.

RULE OF THE ROAD

IN continuing the subject "The Rule of the Road," I would say that we must allow the scientific side of the Rule of the Road Afloat may be studied either at school, or in your own homes, or elsewhere ashore, but the practical side must be learned at sea. You will allow, the two methods should result in a thorough knowledge of the rule of the road.

Rule of the Road Afloat

"The Rule of the Road at Sea," as we will take sea to mean water in our case, is a matter of public safety and should be thoroughly understood by every person that has charge of the deck of any class of vessel. The regulations governing the rule of the road consists of 32 articles and they comprise lights and signals—sound signals in clear or foggy weather—the steering and sailing rules—and distress signals. Remember, as regards the regulations, they are not perhaps our idea, but as issued by Orders-in-Council at Ottawa and being agreed to by nearly all nations (we are talking of international law). Consequently, to disobey any article is to break the law, for law is our point in this article. Whatever our personal views, the law must be observed to the letter, therefore, there is no room for personal opinion, and the articles must be perfectly obeyed and carefully known by every sailor.

Day Mark For Steamship Under Sail

Article 14—A steam vessel proceeding under sail only, but having her funnel up, shall carry in daytime, forward, where it can be best seen, ONE BLACK BALL OR SHAPE, 2 feet in diameter.

Sound Signals For Fog, Etc.

Article 15—ALL sound signals prescribed by this article for vessels under way shall be given:—

(1) By "STEAM VESSELS" on the whistle or siren.

(2) By "SAILING VESSELS and VESSEL TOWED" on the foghorn.

The words "PROLONGED BLAST" in this article, shall mean from 4 to 6 seconds duration.

A steam vessel shall be provided with an efficient whistle or siren, sounded by steam or some substitute for steam, so placed that the sound may not be intercepted by any obstruction, and with an efficient foghorn, to be sounded by mechanical means, and also with an efficient bell; a sailing vessel of 20 tons gross tonnage or upwards shall be provided with a similar foghorn and bell.

In fog, mist, or falling snow, or heavy rain-storms, whether by day or night, the signals described in this article shall be used as follows, viz.:—

(a) Every vessel, in tow of another vessel, shall at intervals of one minute sound 4 bells on a good and efficient properly placed bell as follows:—By striking the bell twice in quick succession, followed by little longer interval, and then again striking twice in quick succession (as in striking 4 bells to indicate time).

(b) A steam vessel under way excepting only a steam vessel with a raft in tow, shall sound at intervals of not more than 1 MINUTE 3 DISTINCT BLASTS ON HER STEAM WHISTLE.

(c) A steam vessel with a raft or a string of booms in tow, shall sound at intervals of not more than one MINUTE a screeching or modoc whistle from 3 to 5 seconds. Only steam vessels with raft or booms in tow shall sound this screeching whistle in thick weather.

(d) A sailing vessel under way shall sound, at intervals of not more than one minute, when on the STARBOARD TACK, ONE BLAST, when on the PORT TACK, TWO BLASTS in succession, and when with the wind abaft the beam THREE BLASTS in succession.

(e) A vessel when at anchor shall at intervals of not more than 1 minute, RING THE BELL rapidly for about FIVE seconds.

Sailing vessels and boats of less than TWENTY tons gross tonnage shall not be obliged to give the above mentioned signal, but if they do not, they shall make some other efficient sound-signal at intervals of not more than ONE MINUTE.

Speed of Ships to Be Moderate in Fog

Article 16—Every vessel shall, in fog, mist, falling snow, or heavy rainfall, go at a moderate speed, having careful regard to the existing circumstances and conditions.

A steam vessel hearing, apparently forward her beam, the fog-signal of another vessel the position of which is not ascertained, shall, so far as circumstances permit, STOP HER ENGINES, and NAVIGATE WITH CAUTION.

REGULATIONS FOR PREVENTING COLLISION

(Cont. from last issue)

Lights For Vessels at Anchor

Article 11—(a) A vessel UNDER 150 feet in length, when at anchor, shall carry forward, where it can best be seen, but at a height not exceeding 20 feet above the hull, A WHITE LIGHT in a lantern so constructed as to show a clear, uniform, and unbroken light visible all round the horizon and at a distance of at least a mile.

(b) A vessel of 150 feet or upwards in length, when at anchor, shall carry in the forepart of the vessel, at a height of not less than 20, and not exceeding 40 feet above the hull, one such light, and AT or NEAR THE STERN of the vessel, and at such a height that it shall be not less than 15 feet lower than the forward light, ANOTHER SUCH LIGHT.

The length of the vessel shall be deemed to be that appearing on her certificate of registry.

(c) A vessel AGROUND in or near a fairway, shall carry the above LIGHT or LIGHTS and TWO RED LIGHTS prescribed by article 4 (a).

(d) Produce boats, canal boats, fishing boats, rafts and other water craft, navigating any bay, harbor or river, by hand-power, horse-power, by sail or current, or which shall be moored or anchored in or near the channel or fairway of any bay, harbor or river, and not otherwise provided for, shall carry ONE BRIGHT WHITE LIGHT forward not less than 6 feet above the deck.

Rafts shall carry in each case on a pole not less than

6 feet high, a bright white light visible all around the horizon as follows:—Rafts of 1 crib in width and not more than 2 in length, shall carry one such light. Rafts of 3 or more cribs in length, one such light on each end of the raft. Rafts of more than one crib abreast shall carry one such light on each outside corner, making 4 lights in all.

Rag or boom rafts navigating or anchored in the fairway of any bay, harbor or river, shall carry a BRIGHT WHITE LIGHT at least 6 feet high at each end of the raft, and 1 such light on each side midway between the forward and the after ends. All double-ended ferry boats shall carry a central range of BRIGHT WHITE LIGHTS showing all around the horizon, placed at equal heights forward and aft, and shall also carry the lights specified in article 2, clauses (b) and (c).

Signals to Attract Attention

Article 12—Every vessel may, if necesary in order to attract attention, in addition to the lights which she is by these rules required to carry, show a FLAREUP LIGHT or use any detonating signal that cannot be mistaken for a distress signal.

Special Lights or Rules

Article 13—Nothing in these rules shall interfere with the operation of any special rules made by the Government of any nation with respect to additional STATION AND SIGNAL LIGHTS for two or more ships of war or for vessels sailing under convoy, or with the exhibition signals adopted by shipowners which have been authorized by their respective governments, and duly registered and published.

Steam Vessel and Sailing Vessel

Article 20.—When a steam vessel and a sailing vessel are proceeding in such directions as to involve risk of collision, the STEAM VESSEL shall keep out of the way of the sailing vessel.

When a Vessel is Required to Keep Her Course

Article 21.—Where by any of these rules one of two vessels is to keep out of the way, the other SHALL KEEP HER COURSE AND SPEED.

Note.—When, in consequence of thick weather or other causes, such vessel finds herself so close that collision cannot be avoided by the action of the giving-way vessel alone, she also shall TAKE SUCH ACTION AS WILL BEST AID TO AVOID COLLISION.

(See articles 7 and 29).

Crossing Ahead to be Avoided

Article 22.—Every vessel which is directed by these rules to keep out of the way of another vessel shall, if the circumstances of the case permit, avoid crossing ahead of the other.

Steam Vessels to Slacken Speed

Article 23.—Every steam vessel which is directed by these rules to keep out of the way of another vessel shall, on approaching her, if necessary, SLACKEN HER SPEED OR STOP OR REVERSE.

As to Overtaking Vessels

Article 24.—Nothwithstanding anything contained in these rules, every vessel, overtaking any other, SHALL KEEP OUT OF THE WAY OF THE OVERTAKEN VESSEL.

Every vessel coming up with another vessel from any direction more than 2 points abaft her beam, in such a position, in reference to the vessel which she is overtaking, that at night she would be unable to see either of that vessel's side lights, shall be deemed to be an overtaken vessel; and no subsequent alteration of the bearing between the two vessels shall make the overtaken vessel a crossing vessel within the meaning of these rules, or relieve her of the duty of keeping clear of the overtaken vessel until she is FINALLY PAST AND CLEAR.

As by day the overtaken vessel cannot always know with certainty whether she is forward of or abaft this direction from the other vessel, she should, IF IN DOUBT, assume that she is an overtaken vessel and KEEP OUT OF THE WAY.

Steam Vessels in Narrow Courses

Article 25.—(a) In narrow channels every steam vessel shall, when it is safe and practicable KEEP TO THAT SIDE of the fairway or mid-channel which lies on the STARBOARD SIDE OF SUCH VESSEL.

(b) In all narrow channels where there is a current, in the RIVERS ST. MARY, ST. CLAIR, DETROIT, NIAGARA, AND ST. LAWRENCE, when two steamers are meeting THE DESCENDING STEAMER shall have the right of way and shall, before the vessels shall have arrived within the distance of half a mile of each other, give the signal necessary to indicate, which side she elects to take.

Fishing Boats to be Avoided

Article 26.—Sailing vessels under way shall keep out of the way of SAILING VESSELS OR BOATS FISHING WITH NETS OR LINTS OR TRAWLS. This rule shall not give any, vessel or boat engaged in fishing the right of obstruction a fairway used by vessels other than fishing vessels or boats.

Proviso For Special Cases

Article 27.—In obeying and construing these rules, due regard shall be had to all dangers of navigation and collision, and to any SPECIAL CIRCUMSTANCES which may render a departure from the above rules necessary in order to avoid immediate danger.

Sound Signal For Vessels in Sight of One Another

Article 28.—The words "SHORT BLAST" used in this article shall mean a blast of about ONE SECOND'S DURATION.

When vessels are in sight of one another, a steam vessel under way, in taking any course authorized or required by these rules, shall indicate that course by the following signals on her whistle or siren, viz.:—

(a) One short blast shall mean, "I am directing my course to starboard."

(b) Two short blasts to mean, "I am directing my course to port."

Vessels approaching each other from opposite directions are forbidden to use what has become known among pilots as "CROSS SIGNALS" answering one whistle with two, and answering two whistles with one.

If the pilot of a steam vessel to which a passing signal is sounded deems it unsafe to accept and assent to said signal he shall not sound a cross signal; but in that case, where the pilot of one steamer fails to understand the course or intention of an approaching steamer, whether from signals being given or answered erroneously, or from other causes, the pilot of such steamer so receiving the first passing signal, or the pilot so in doubt shall sound several short and rapid blasts of the whistle, NOT LESS THAN FIVE; and if the vessels shall have approached within half a mile of each other both shall reduce their speed to bare steerage way, and, if necesary, stop and reverse.

Whenever a steamer is nearing a short bend or curve in the channel where from the height of the banks or other cause a steamer approaching from the opposite direction cannot be seen for a distance of half a mile, the pilot of such steamer, when he shall have arrived within half a mile of such bend or curve, shall give a signal by one long blast of the whistle, which signal shall be answered by a similar blast given by the pilot of any approaching vessel that may be within hearing. Should such signal be so answered by a steamer on the further side of the bend, then the usual signals for meeting and passing shall immediately be given and answered, but

if the first alarm signal of such pilot be not answered, he is to consider the channel clear.

No Vessel Under Any Circumstances to Neglect Proper Precautions

Article 29.—Nothing in these rules exonerate any vessel, or the owner, or master, or crew thereof, from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

Reservation of Rules For Harbor and Inland Navigation

Article 30.—Nothing in these rules shall interfere with the operation of a special rule, duly made by local authority, relative to the navigation of any harbor, river, or inland waters.

Distress Signals

Article 31.—When a vessel is in distress and requires assistance from other vessels, or from the shore, the following shall be the signals to be used or displayed by her, either together or separately:—

IN THE DAYTIME—

(1) A gun or other explosive signal fired at intervals of about a minute.

(2) The international code signal of distress indicated by N. C.

(3) The distant signal, consisting of a square flag having either above or below it a ball or anything resembling a ball.

(4) A continuous sounding with any fog-signal apparatus.

AT NIGHT—

(1) A gun or other explosive signal fired at intervals of about one minute.

(2) Flames on the vessel (as from burning tar-barrels, oil barrels, etc.

(3) Rockets or shells, throwing stars of any color or description, fired one at a time, at short intervals.

(4) A continuous sounding with any fog-signal apparatus.

How Rafts Should Be Anchored and Navigated in Rivers and Narrow Channels

Article 32.—Rafts, while drifting or at anchor, shall be governed as regards lights to be carried by article 11, clause (d). Whenever any raft is going in the same direction as another which is ahead, the one shall be so navigated as not to come within twenty yards of the other, and every vessel meeting or overtaking a raft shall keep out of the way thereof.

Rafts shall be so navigated and anchored as not to cause any unnecessary impediment of obstruction to vessels navigating the same waters.

Paying for the War

THE aftermath of Great Britain's long struggle is reflected in the speech of Mr. Lloyd George, warning his countrymen of the necessity of buckling down to earnest work to pay their debts. Great Britain poured out her blood and treasure with a lavish hand, and gave of what was her most vital asset unsparingly, that is her superb merchant fleet. Although the returns for the quarter ending June 30th show that she is beginning to pick up in this direction, she is still a long way behind, and the production of the coal mines has fallen off lamentably. With more men than ever before employed in the mines, the short hours and higher wages have increased the production cost enormously. The attitude of the labor unions under these circumstances is hard to understand. What benefit will accrue to them if they kick the country into bankruptcy is difficult to imagine, and we cannot think that the sound common-sense of the British people will allow the warning to go unheeded. There is a lesson to be gained from the British situation that should not be lost on some of the malcontents in Canada.

THE COUNTRY will sympathize with Sir Robert Borden in his unfortunate accident, which compels him to remain in bed while the festivities are in progress. However, it might be worse. In days gone by, a slip by a public man on the steps of a club when leaving would have given rise to many unkind conjectures.

DR. R. J. McFALL must be trying to get a position abroad. He has now got up and said right out that the price of beef has dropped. To call attention like that to a thing that nobody had even noticed, is sure to get him disliked. We expect to hear shortly that he has received an appointment to investigate the clothing situa- in the Solomon Islands.

As a fundamental thing it might be well to say that labor should practise as well as preach. That is, take the same attitude towards capital that it asks capital to assume towards labor, live up to its agreements with capital, and be responsible for its acts.

"Scientific management" does not mean giving the smallest possible wage and selling the product in the dearest market—it means the greatest possible output with the least possible expenditure.

There is no doubt that there would be room for still further reductions in hours, and for considerable improvements in both time and piece rates, if we could as a nation accept the theory that when we are at work we should work with all our might.

The prospect for a broader development of the chrome iron deposits of the Eastern Townships is one of considerable interest to Canada as the deposits are quite extensive and have not been worked to advantage for many years.

Prior to the war these were worked by open cuts or quarries but the process became expensive and dangerous as operations descended to considerable depths and had to be abandoned owing to the low market price for the commodity. The big deposits which have served the big steel producing centres of the world are in Rhodesia and New South Wales, so that during the war the commodity advanced to a high price around $32 per ton.

SOME critics in England consider the money grants to the successful military and naval leaders as rather niggardly, if anything. Well, what does a half million pounds or so amount to in these days, when wealth is computed in billions?

Dissolve one part of pearl ash in about eight parts of water; add one part of shellac and heat the entire mixture up to the boiling point. When the shellac has completely dissolved, cool the solution, and saturate it with chlorine until the shellac precipitates out entirely. When it is redissolved in alcohol, it makes a varnish which is as transparent as any copel varnish, and more satisfactory for a large number of purposes. This is a trade secret worth knowing.

To conserve the fats contained in the table refuse and dishwater of the soldiers' mess, the British military authorities installed grease traps. The fat collected in these traps averages more than one ounce for each man daily. The trap consists of a tin-lined wooden box, divided into two compartments by a partition that does not reach the bottom by about four inches. The dishwater and the table refuse are poured through a strainer into the vat. As the water cools, the fat forms a crust on top and is skimmed off.

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

THIS vital subject is always a favorite with examiners as it has a very wide field both in theory and practice, and if a young fellow shows his tact and studious capacity with the models, a fair number of minor sins may be forgiven on the day he gets his first certificate. There is very little cross traffic on our Great Lakes, and it is possible to run for months and never actually give way to a crossing ship, but at the same time, the rules are set down to be mastered by every class of mate and skipper afloat, lake, coasting, or ocean.

Right now I advise every prospective officer of the deck department to make his own models and study the rules and regulations in picture as well as in type. Cardboard models cost nothing but a little patience in cutting them out, and it is amusing as well as instructive.

Cast iron laws cannot even save the railroads from collisions, so you can readily understand that floating traffic, with its changeable circumstances in speed, type of ship, weather, and sea room, is a pretty fickle subject to interpret in its 101 predicaments. The sailing ship rules are the hardest to grapple with, but they are the key to the whole affair, so don't imagine that because you never intend going on a windjammer that you can get clear of learning the rules.

A Few General Hints May Be Useful

(a) If you are closehauled, the "other tack" ship will bear down on your lee bow. That is, if she is within the collision zone. Of course she would show you an opposition light, i.e., green to your red. An instance of this would be sighting a green light on your lee bow when on the starboard tack. The green ship would be on the port tack.

(b) When you are closehauled, opposition lights to windward must be free ships.

(c) With wind on the quarter an opposition light to leeward is closehauled on the same tack as you have the wind, and an opposition light to windward is either dead before it or has wind on the opposite quarter.

(d) With opposition lights about six points from right ahead, the vessels carrying them are either going with you or, should they be crossing, their other colored light will soon peep out and make the position safe.

(e) Both for steam and sail, opposition lights abaft six points are safe unless carried by much faster craft.

(f) For sail, the starboard tack ship is the safest position as far as the rules of the road are concerned.

The Bearing Procedure

There is nothing so accurate as the bearing procedure in determining whether or not an approaching vessel is going to hit or miss you, and from the time you stand watch on a steamer's bridge it should be put into practice. Remember we are talking of collision lines, not green to green or red to red propositions. Take the compass bearing of any opposition light in your bow —a green to your red or a red to your green. Should the bearing remain stationary as both vessels continue on their course, you are bound to collide. If the bearing alters towards your stern, taking on an abaft position, then all is well, collision is impossible. Should the stranger's bearing "close in" on your bow, i.e., come more ahead, the position is safe, but it needs watching. The fact that the opposition light is crawling across your bows means that your ship is falling astern of the point of contact. The only thing in this case which would invite trouble would be the changing of speeds. If your craft put on more speed or the stranger reduced his, collision could still happen. In cases where a vessel is crawling across your bows slowly, do not aggravate the position by yawing around just because, technically, the rules are in your favor, rather help him to get out of the road. The rules invite seamanlike practice as well as detailed procedure, and to facilitate each other's movements is the very essence of the regulations.

Steamers must not take for granted that they can cross all sailing ship's bows. Some old Norwegian barques and Atlantic schooners can draw circles round the tramp steamboat at times, so bear in mind that canvas is not always second to bunker coal. It is only a week ago since the "Cutty Sark," moored in London under a foreign flag and name, but she is still a wizard at speed when the wind-god plays his tunes over her quarter. Such vessels can pass tramp steamers as if they were at anchor, and each sea and coast has its "Cutty Sarks," their speeds ranging from ten miles an hour "on a bowline," i.e., closehauled, to 15 an hour with the wind and sea from the poop.

When flanked with a faster steamer on your starboard side, who has just a point or so of crossing in her course, don't haul toward her, rather ease your ship with the engines for a few minutes, or run parallel with her until her stern is to you, then haul back. In cases like this, the ships really sag together, and the predicament is more exasperating than the one in which a vessel crawls slowly across your stern. The reader must note then that the caution which he uses and puts into effect with a ship proceeding at right angles to him is different to what must be done where the two vessels are coming together in almost parallel lines. All this will unfold itself after you practise with models. The first thing to do in planning the study is to write to Ottawa (Marine and Fisheries Department) and get a recognized booklet on the Rules and Regulations. It is a mistake to interpret such matters from old books of a decade ago, and the Government is only too pleased to mail you the latest information.

Diagrams

The idea of giving a few diagrams is to open up the subject in an interesting way and show you how to study it, i.e., how to think. That small word has an awful meaning to a sailor, whose work is of the qui vive nature.

The large model shows you one bearing of a green light on the port bow, with all possible courses radiating from it. The bearing is exactly one point from right ahead. In other words, a vessel, whether steam or sail, which shows you a green light a point on your port bow, must be proceeding in one of the ten directions indicated by the fingers.

Now, take a similar example of the same opposition light, but further aft, to be precise, two points abaft the beam; the theoretical fence in the regulations. How do the possible courses run this time? In a much safer way. Anyone can see at a glance that the ship showing green at two points abaft the beam could only hit you by downright pigheadedness, whereas the fellow showing green a point on your port bow must cross your port or hit you with his stern or broadside. In fact collision is inevitable unless one or the other alters their course. What, then, does a student of the rule of the road infer from such geometrical proof? Simply that to master such work thoroughly one must study it from bearings and angles of the compass or horizon. Only in such a manner and with the aid of models and compass card can any young man expect to get well up in the knowledge which should prevent collision. Remember that the unwritten rule of the road is, "Keep out of collision."

The shaded part of the large model on the starboard side shows you the zone in which opposition lights are not so dangerous as in cases where they are met with forward of that area. In this dotted zone, however, we sometimes find that something must be done to make a gulf between two approaching vessels.

Say that you do sight an opposition light in the dotted sector, what is it likely to be? A vessel going at right angles to you and in this case the stranger will soon open up his green to your green, or red to your red, whichever it happened to be.

The great nuisance, however, in the

dotted area, is the vessel that has only a little crossing in her course and is practically sagging down on top of you in a broadside manner. In such cases, if it is your place to keep clear, don't hesitate but get out of the ugly position. If the other vessel is faster, run parallel with him for a few minutes, but if he is of the same speed as you are, just reduce your speed a couple of minutes and the ship causing the trouble will shoot ahead.

Another vessel, but a harmless one, which gets into the dotted space is a slower ship going the same way. She opens up an opposition light, but a compass bearing of it soon shows you that it is carried by a vessel which is falling astern and therefore cannot touch you. What has been said of the large model applies to both sides of the ship.. To further simplify the illustrations I will put two questions to you which you frequently have to show a knowledge of at the examinations, and they are reflected in the diagrams.

Question.—Your ship is heading SE, a green light appears one point on your port bow. How might the stranger be heading?

Answer.—One point on your port bow would be SE by E. A green light bearing SE by E would be carried by a vessel steering from S by W round to NW by W.

Question.—One the same course you see a green light bearing NNE. How might that ship be heading?

Answer.—Between E and SSW.

Both these questions are worked out on the port side of the large model. The only difference is that your answers are derived by a memory trick in connection with the compass card and mine are laid down in geometry. The trick is given in two forms in all books that guide the seaman.

Those desirous of making a ready-reckoner for the above kind of queries from cardboard should write the editor of this paper for instructions.

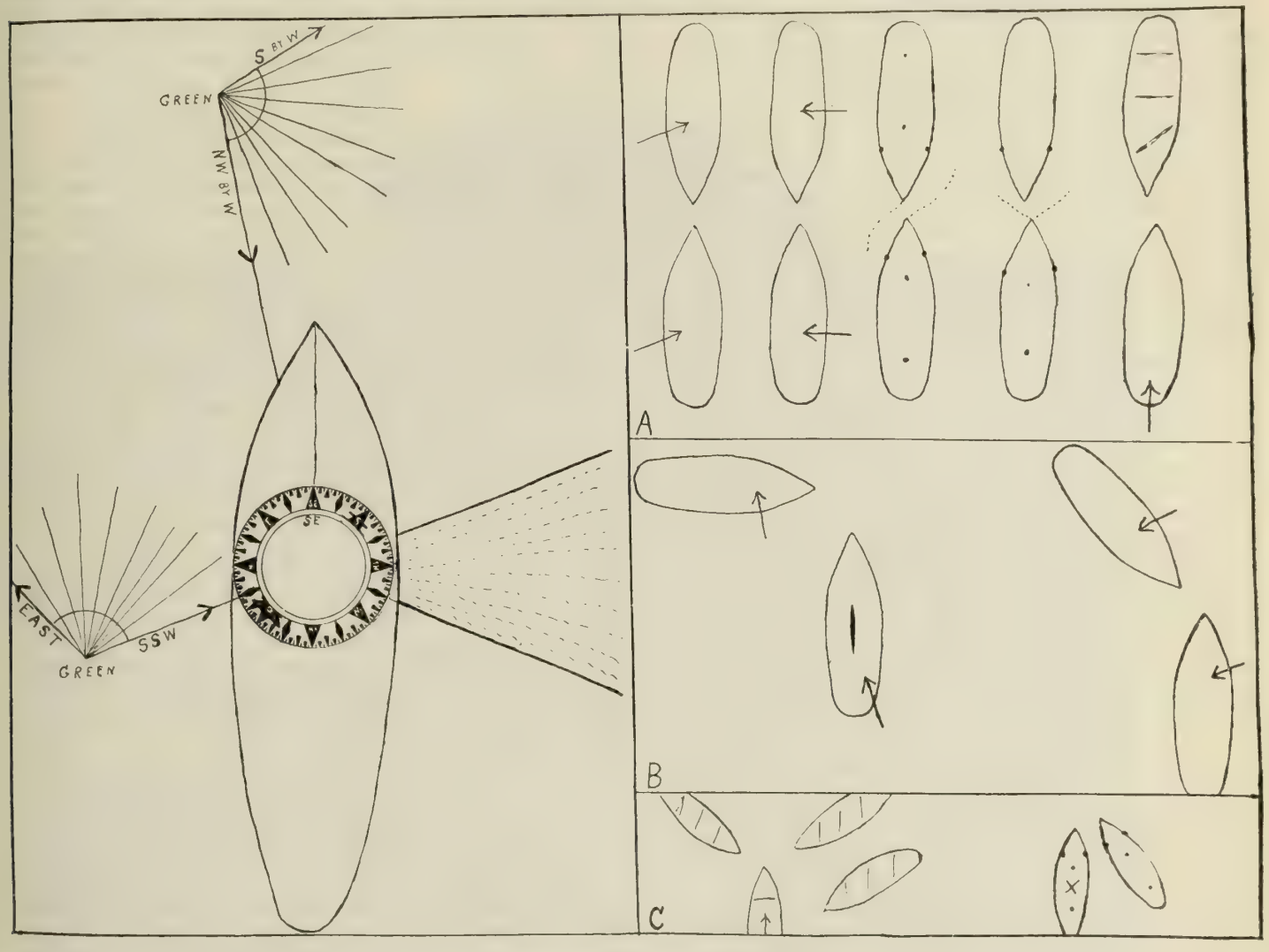


DIAGRAM SHOWING POSITIONS

The Smaller Diagrams

Chart A. This depicts five ways in which vessels can meet end on, and helps the student to interpret still more widely the angle and straight line system of studying the rule of the road.

Reading from right to left, the first two craft are examples of a close-hauled ship meeting a free ship. The lower model has the wind two points abaft the beam to port, while the other is on the starboard tack. Now, if you have the wind two points abaft either beam, remember that a close-hauled ship can come down right ahead.

The second two have a soldier's wind, i.e., wind abeam, one has it to starboard, while the other has it to port, thus they can meet end on.

In the third case we have the famous steamboat position, and show how each steamer or power vessel must alter her course to starboard. The fourth illustration is a steamer and sailing ship meeting end on, and it is a question of circumstances which way the steamer goes to avoid collision and carry out the rules.

In the fifth case we have a peculiar but common happening, a windjammer "running," i.e., wind dead aft, and meeting a ship "in stays." A ship "in stays" is one which is manoeuvring from port to starboard tack or vice versa.

Chart B. Angled positions are shown here. The ship with the wind two points on the starboard quarter meets a craft at right angles on the starboard tack. Now if the lower craft had the wind two points on the port quarter she would meet the port tack ship on the other bow, but at the same angle. The whole thing is in lines and angles.

The two models to the right show you how close-hauled ships meet each other in the collision zone. Each craft sees an opposition light on its lee bow, generally between one and four points on

the bow. The regulations tell you that the lower ship in this case would "stand on."

Chart C. Shows how close-hauled ships look to a vessel before the wind, if ahead. At such an angle it is easy to deduce that should these close-hauled ships be broad on the bow their opposition lights will suddenly turn into the red to red or green to green positions. My point is explained by showing a port tack ship out on the bow. Her opposition light is giving its last blink, and her green is opening.

Now look at the awkward position of the two steamers. X is carrying all the worry, while the two come together sideways. If the stranger has the superior speed, X should reduce his own ship and let the nuisance forge ahead out of danger. Remember that the rule of the road and the engine room telegraph are allies. In work of this nature also bear in mind that the red and green lights of all vessels are fixed parts of a circle that is completed with the stern light arc. The degrees in the circle are summed up thus, green 112½ deg., red 112½ deg., white 135 deg. equals 360 deg. Thus the collision lines, zones or angles made by moving vessels are best understood when studied in diagram or model form, where the ship's movements and the compass card impress the student in a geometrical manner. The actual meaning of the cold type which the rules of the road are printed in can then be easily dealt with, and memorizing the rules like a parrot is eliminated.

If you are ever jammed for room as you must be occasionally through fog or ice, rather go round the long way than swing to starboard and collide. The position I have in mind is when your steamer has another steamer's red light close on the starboard bow. While it is customary to port the helm for such a position, far better swing in the other direction although it does mean going right round the compass.

ELECTRICITY OR COMPRESSED AIR

This comparison is of interest to the production manager and factory superintendent in deciding either of two questions: Will it pay me to replace my air equipment with electric equipment, or will my new installations be pneumatic or electric? The three factors to be considered are: source of power, distribution, and performance. Cost is a function of all three.

It may usually be assumed that electric power is available, either central station service or private service. In such cases we can dismiss the source of power item. Where electric power is not available, the choice is between generating it or compressing air. To get anywhere now we must make some assumptions. It requires about 22 brake horsepower to deliver 100 cubic feet of free air per minute at 90 lbs. pressure. This same 22 brake horse-power will deliver 14 kw. driving a generator with 85 per cent. efficiency.

This power must now be distributed. The distribution of the electric power is flexible, permanent, efficient and much cheaper. Ten per cent. is the maximum allowance that need be made for loss. We have, therefore, 12.6 kw. at the tools. An air line is costly to install, inflexible, subject to freeze-ups, leaks and generally high cost of upkeep. It is impossible to prevent leakage, even with constant replacements of hose and repair of joints. The cost of this item may be tremendous.

To illustrate, the amount of leak for very small holes in a 90 lb. system will be:

Size hole	Amount of leak in cubic feet per minute
1-16 in.	6.0
1-32 in.	1.5

I believe you will allow me to put the loss of pressure by friction at 10 per cent., offsetting the electrical distribution loss. The leakage is a very uncertain item that may reach almost any figure if the system is not carefully maintained. We are quite charitable in placing this loss at 10 per cent. We now have 90 cubic feet of air at the tool under about 80 lbs. of pressure.

The question now is: Which will do the most work, the 90 cubic feet per minute of compressed air at 80 lbs., or 12.6 kw. of electric energy? The efficiency of an electric motor is constant throughout its life, but the efficiency of an air motor falls continuously as the piston and valves wear. Assuming that we have a new air drill, let us compare results on the basis of the ½ inch tool. The manufacturers of two standard makes of pneumatic tools give the air consumption of the ½ in. drill as 15 cubic feet for the 4 cylinder piston type and 20 cubic feet for the rotary piston type.

Our unit of air supply would therefore take care of 5 or 6½ inch pneumatic drills. I will venture to state that a ½ inch electric drill with 550 watts input will outdrill the air tool and at this consumption our unit of power will operate 23 electric drills.

The efficiency of the tool in the hands of the operator is affected by weight, balance and vibration. The advantage of weight obtained in some sizes of air tools is more than offset by the better balance and lack of vibration in the electric tool.

Apply common-sense with your cost system. The easiest way sometimes is the best way. Keep everything simple. Don't make anything harder than it ought to be. But remember to keep the main idea constantly in view—"I want to know my costs!"

Ho! ye who in the workshop toil and sweat the long day through, remember that it's harder still to have no work to do. Ho! all who labor, all who strive, ye wield a mighty power. Do with your will, do with your might, fill every golden hour. The glorious privilege to DO is man's most noble dower.

A NEW RUDDER

A rudder of a completely novel type, which has been used on small vessels during the war, is about to be developed commercially. It is named after its inventor, Mr. J. G. A. Kitchen of Lancaster. It enables a boat to be steered, reversed, controlled and turned by a single tiller, and with the engines running continuously in the forward direction. The rudder consists of two parts which, when closed form a cone, apex pointing aft; and, when fully open, form a sort of tunnel in the wake of the screw. Whether shut or open the rudder as a whole can be turned to port or starboard like one of the ordinary kind. When the rudder is closed the propeller stream entering the open mouth is deflected forwards by the sides of the cone, brings the vessel to rest, and then moves it astern. The partial opening of the plates allows some water to pass through, and the speed and direction of the boat can thus be controlled without slowing the engines. For ordinary steering the rudder is opened fully, and deflects the propeller stream to one side or the other. It has an extremely powerful braking effect, and is capable of arresting a vessel in its own length; while its capacity for deflecting the water driven aft by the propeller renders it very useful for manoeuvring in restricted places.

Kingston.—The steamer Phelan went aground at Fraser's Shoal, below Cardinal, and the Donelly Wrecking Co. were requested to send a tug to her assistance.

London.—There will be no attempt on the part of British shipowners to rival the proposed 1,000 feet liners of the American Shipping Board. The tendency is to build vessel of moderate size and speed, and more of them, in an endeavor to catch up with the shortage. To build another "Aquitania" would cost more than double the amount that vessel cost.

London.—The Board of Trade announce the awarding of the silver medal for gallantry in saving life at sea to the following: Capt. E. C. Perry, Temporary Skipper Martin Dalton, and Seamen Harold Clouter, Charles W. Penney, Adolphus Morey, Daniel Ralph and Michael Whelan, and the bronze medal to Chief Engineer Robert Pierson and Seamen Mathew Shanahan, Patrick Gallagher, George Westcott and Joseph Budden. The occasion when the services were rendered by these men was when the steamer Florizel of Liverpool stranded on the Newfoundland coast about 15 miles N.E. of Cape Race. A heavy sea was running, and in response to wireless calls for assistance, several vessels arrived from St. Johns but were unable to approach the wreck till the following day. They started at daylight and had all the survivors taken off the wreck by 8 a.m. The rescue had to be effected by means of dories, and it was in performing these rescues that the men mentioned above displayed great bravery and saved many lives.

W-S-M
Coal Handling Equipment

The Virginian Railway Company transfers from road cars to ships over four million tons of coal a year at its coal handling plant at Sewell's Point, Va.

This is accomplished by the use of W-S-M equipment. The car dumper shown below unloads two cars at a time. It grips them securely, lifts and overturns them and places them back on the track at the rate of sixty cars an hour. Bulletin No. A11 gives further interesting data concerning this installation.



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MARINE NEWS FROM EVERY SOURCE

Buffalo.—Several of the crews of ships leaving the Great Lakes for European waters are refusing to sign for any further distance than Montreal, owing to the strike of shipworkers on the Atlantic coast.

C.P.R. Ordered to Start.—The Canadian Pacific Railway Co. has been ordered by the Dominion Railway Board to begin the construction of its new terminals at Kingston not later than May 20, 1920.

London.—The Shipping Engineering and Machinery Exhibition that will be open in September will afford the public an opportunity to see the luxury and ease of sea travel. Everything of interest from a marine engineering standpoint will also be on view, and there will be no exhibits of enemy origin in the exhibition.

St. Johns.—High freights offering to Buenos Ayres and other southern points have denuded the market of steamer offerings, but there are plenty of sailing vessels. They are getting from 345 shillings to 350 shillings for transatlantic cargoes per standard. Lumber mills are all busy, with good prospects for future business.

Cleveland.—The death is announced of Capt. Charles A. Benham, master of the steamer John Stanton, of the Hutchinson fleet. He was only 51 years of age, and was in active service up to a week from his death. He is survived by his father, Captain C. E. Benham, and four brothers, besides a widow and two sons.

Going After Trade.—The B. C. and Overseas Trading Company, which was formed recently with "Expand B. C. Industries" as a slogan, is going after trade in the Orient. Mr. J. Fred Sanders, the president, has gone to China to study the needs of the market there and will send back instructions to the firm concerning the goods required, methods of packing, weights, measurement and style to conform with the customer's wishes.

Valuing Fraser River Yard.—An arbitration board has been sitting in the Vancouver Court House to determine the value of the plant of the Imperial Munitions Board in the Poplar Island yard of the New Westminster Shipbuilding Co. The public sittings have been concluded but the award has not yet been given out. During the proceedings the contract between the Imperial Munitions Board and the New Westminster Co. was produced. The agreement was that the company should be reimbursed for the actual cost of building each hull, and receive a sum of $16,000 profit on each. The board consists of Mr. Justice Morrison, Mayor Gray of New Westminster, and Arthur H. Edwards.

Sold Equipment.—The Beaver Engineering Company of Montreal have disposed of nearly all their equipment and will shortly be out of business.

Cleveland.—A large number of freighters are being held idle owing to the strike of ore dock workers at Superior. A number of vessels have loaded coal and are holding it until owners are sure that there will be no delays in unloading at Lake Erie ports.

Paris.—The French Minister of Public Works, M. Albert Claveille, announced in the Senate that he would shortly submit a plan whereby France's mercantile tonnage would be increased to more than double the pre-war tonnage in the next three years. The aim of the Government would be to build 5,000,000 tons in French yards.

Buffalo.—There are six freighters on the way to Buffalo with approximately 1,500,000 bushels of grain aboard them. By the first week in September the full movement of grain will be under way. Shipments of ore are increasing and hopes are entertained of a good season despite the slow start.

Hamilton.—A big appropriation having been made by the Dominion Government early in the year for work on the harbor, the Board of Harbor Commissioners are anxious to get it started. To this end Mr. T. J. Stewart, M.P., attended the meeting and promised to use his good offices to get the work started as early as possible.

Sault Ste. Marie.—Freight through the Soo canals shows a decrease from that in July, 1918, of 1,446,192 tons. The amount carried this July was 11,916,152. Two-thirds of this tonnage was going eastward. Of the total tonnage only 533,377 was carried through the Canadian canals.

North Vancouver.—After the launching of the C-39, the last of the eight ships built for the French Government from the Lyall yards, a number of the men were laid off. There are now only about 300 men employed in fitting out the vessels already launched. The yards at one time employed 1,200 men.

Halifax.—The steamer "Troja," which was recently salvaged at the entrance of the Bay of Fundy by the Maritime Wrecking Company of Halifax, has been brought to Halifax in a pretty bad condition. The repairs will be given to the firm making the most successful tender, and it is thought here that the job will go to the Halifax Shipyards Ltd., who are operating the dry dock.

Victoria Yards Please New York.—The success of the Foundation Company's yards at Victoria, has attracted favorable notice at the head office of the organization in New York, according to Frank Quilter, secretary-treasurer of the company. The good performances of the Victoria built ships on their trial trips has been the subject of much favorable comment. The Foundation Company are now at the height of their activity in Victoria, and the payroll amounts to over $500,000 per month.

Victoria.—The French Commission that has been in British Columbia looking after the wooden vessels building here for the French Government, has given expression to their great satisfaction with the class of ship turned out in the yards here. They say they excel the same type of vessels built in the United States in many particulars. Their construction and equipment is better, there are less alterations required, with a consequent reduction in delays. This applies both to the 1,500 ton class and the 3,000 ton class wooden ships.

Toronto—Passengers from the Huronic which went ashore on the Angus Islands in Lake Superior, were transferred to the Harmonic, and taken down to Sarnia, from whence they came down to Toronto by train. They said that only the fact that there being calm seas prevented a great disaster. They spoke appreciatively of the conduct of the ship's officers, and also said that the unpleasantness of the situation was alleviated by the courtesy and care received from the company's officials.

Washington.—The United States Shipping Board announces its sales of ships up to August 14th. The vessels number 185 and the sum received amounts to $127,187,740. The tonnage sold is 712,727 deadweight. The number of steel ships sold was 122, including the vessels sold to the Anderson Oversea Corporation. The steel ships brought $99,645,060. The 63 wooden ships were sold for $27,546,680, the total tonnage of these ships being 246,982 deadweight.

Victoria.—The increase granted by the MacDonald award of 2¾ cents per hour is not being met by the employers. The Harbor Marine Company has refused to pay the additional amount, on the ground that none of the other steel companies are doing so. The employees of this company held a meeting and decided that they were willing to go on with the present rate of wages.

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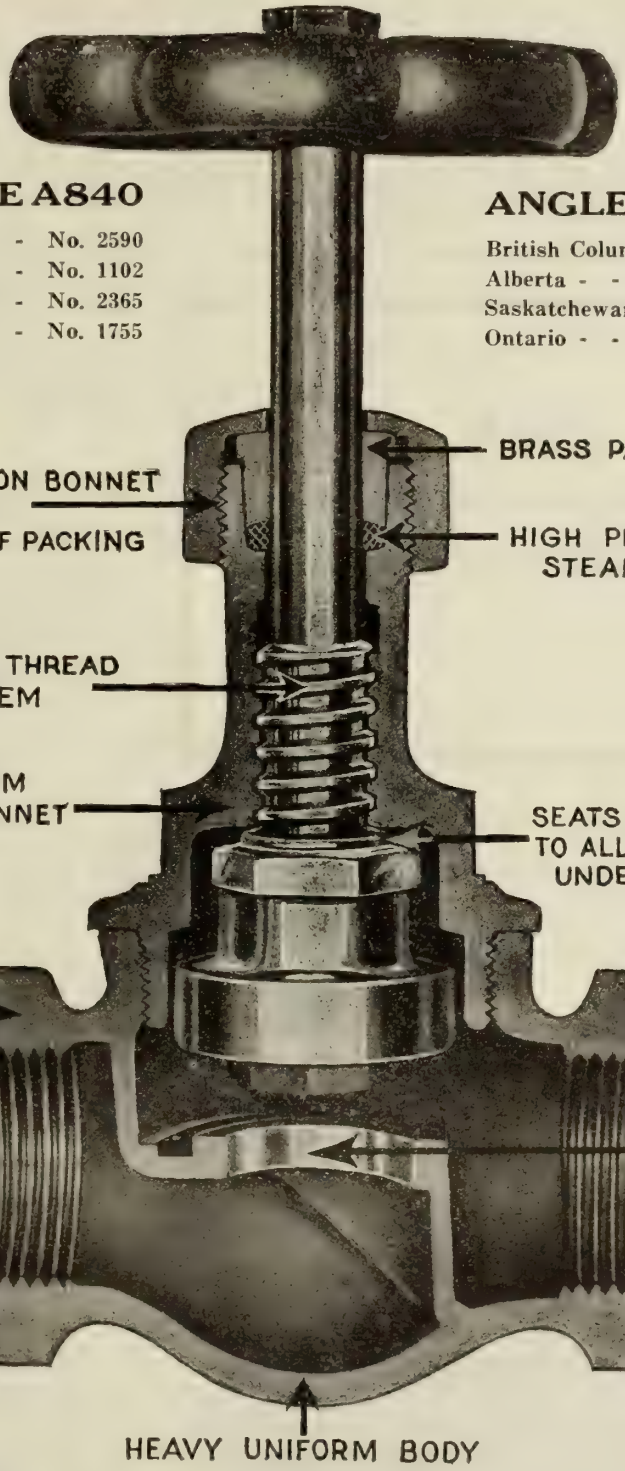
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Vancouver.—The Pacific Steamship Co.'s wooden steamer, "Admiral Knight" was burned to the water's edge, and left a charred derelict off the mouth of the Fraser River. Her crew were rescued by the Princess Victoria, bound from Victoria to Vancouver, and landed at Vancouver. The crew consisted of 23 men, and all were gotten off safely. The cause of the fire is unknown, but the blaze started in the engine room. The wooden construction and the oil fuel made fighting the flames an impossibility. The crew lost all of their belongings, and the pilot even had his license burned.

Port Stanley.—The inauguration of the steamer service between Cleveland and Port Stanley was attended with several undesired features. The "Theodore Roosevelt," a 22-knot steamer, arrived from Cleveland with 1,500 passengers, and reached the Government wharf in safety. It was when she tried to get away again that the trouble started. She tried to turn at the dock, but her stern grounded on the undredged channel and she had to give up the attempt. In trying to get out stern first the vessel was blown by the stiff breeze up against the old pier. Trying to clear this her forward end stuck in the mud. Finally she was towed out into clear water by a tug, not before breaking a few piles from the old pier by trying to make fast a rope to them. The American passengers asked earnestly from the Canadians on the quayside if this was really the finest harbor on the Canadian side, as advertised.

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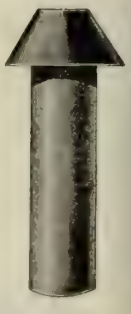
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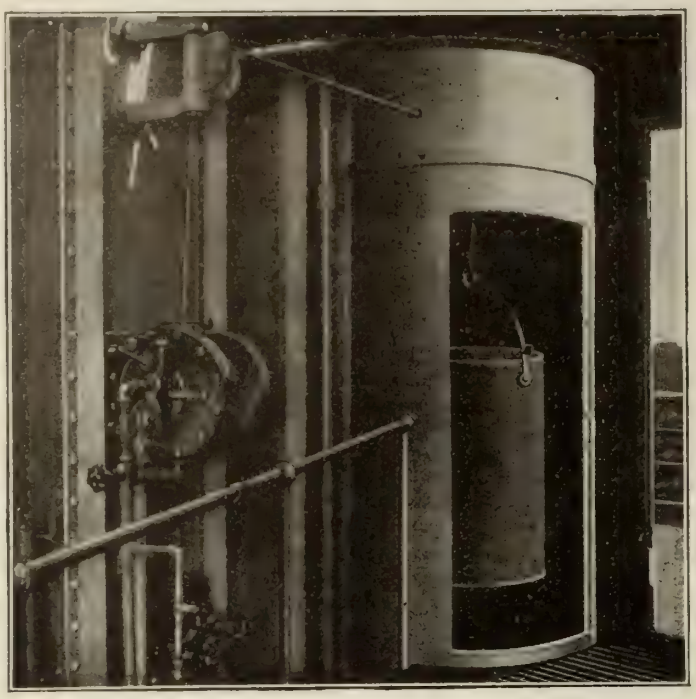
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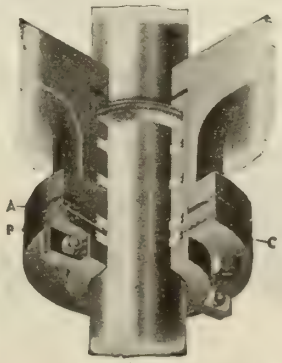
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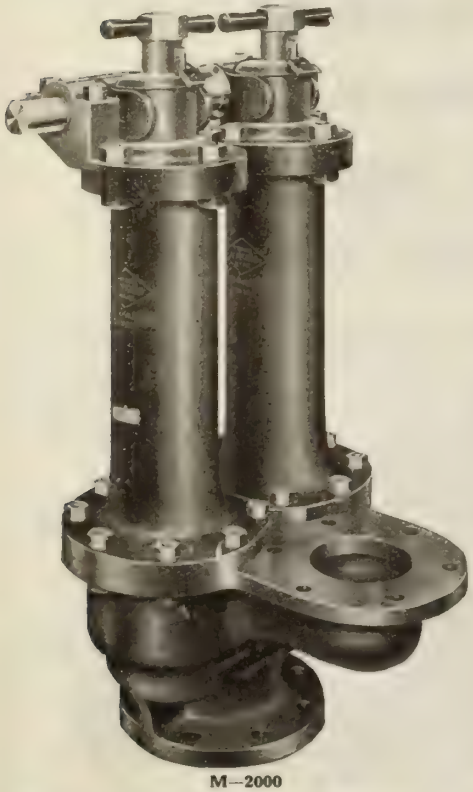
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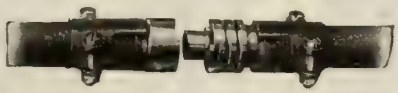
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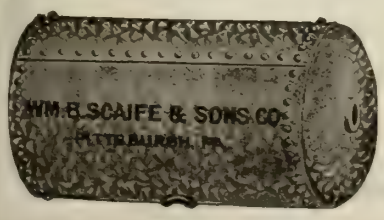
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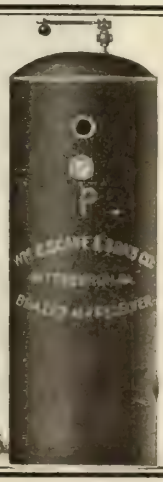


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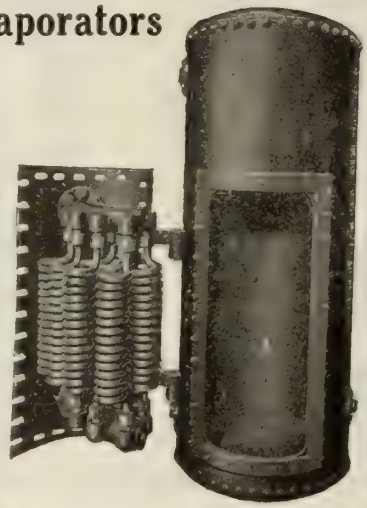
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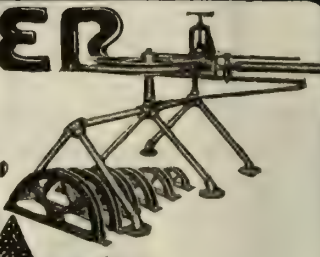
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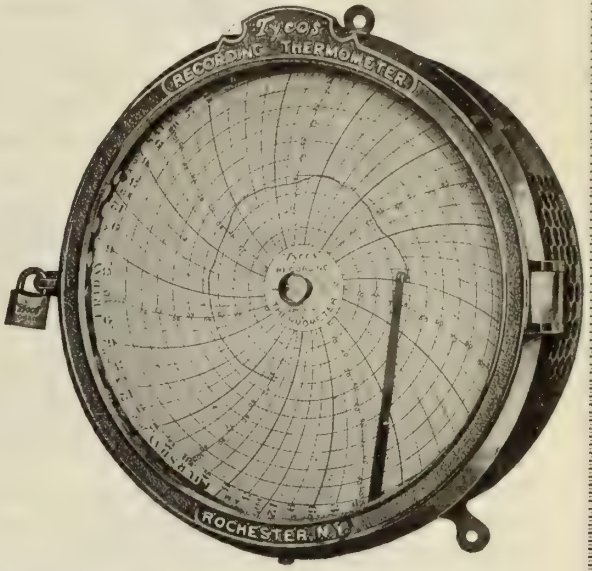
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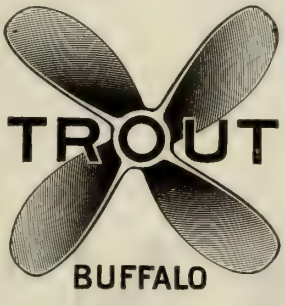
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Stephen Leacock is one of the continent's greatest humorists. "The Lecturer at Large" is one of the best humorous sketches that he has written. It is made up of what he terms "a few painful reminiscences of the platform" in the course of his lecturing up and down Canada. Get your family around you and read the sketch aloud—it's a rare treat.

Other Big Features

"A Party in the Making." By J. K. Munro. Illustrated by William Casey. An article on the political situation, giving a great deal of inside information with reference to recent developments at Ottawa.

"Solving the Problem of the Arctic." By Vilhjalmur Stefansson. The fifth instalment of his story of the five years' explorations that he conducted for the Dominion of Canada.

"The Unspoiled Country." By Harold C. Lowrey. A descriptive article of a part of Canada which is little known to Canadians generally, Temagami.

"Petite Simunde." By Arthur Beverley Baxter. Illustrated by E. J. Dinsmore. A charming romance of the war. The author will be remembered favorably for his "Mr. Craighouse of New York, Satirist."

"The Seven Blue Doves." By W. A. Fraser. Illustrated by Charles L. Wrenn. The fifth of the Bulldog Carney series and in some respects the best. It is a mystery story.

"His Majesty's Well-Beloved." By Baroness Orczy. Illustrated by C. F. Peters. The second instalment of this splendid romantic novel of the colorful era of Charles II.

The Month's Vital Question

Turn to page 34, August MACLEAN'S, and you will find timely and interesting information regarding the High Cost of Living—a problem of large proportions.

The Review of Reviews

Here are a few of the articles chosen as the best published during the past month in all magazines:—Britain Winning Supremacy of the Air; Has Japan Two Governments?; Kaiser Employed Famous Beauties; The New Triple Alliance; Mammoth Animals in Alberta.

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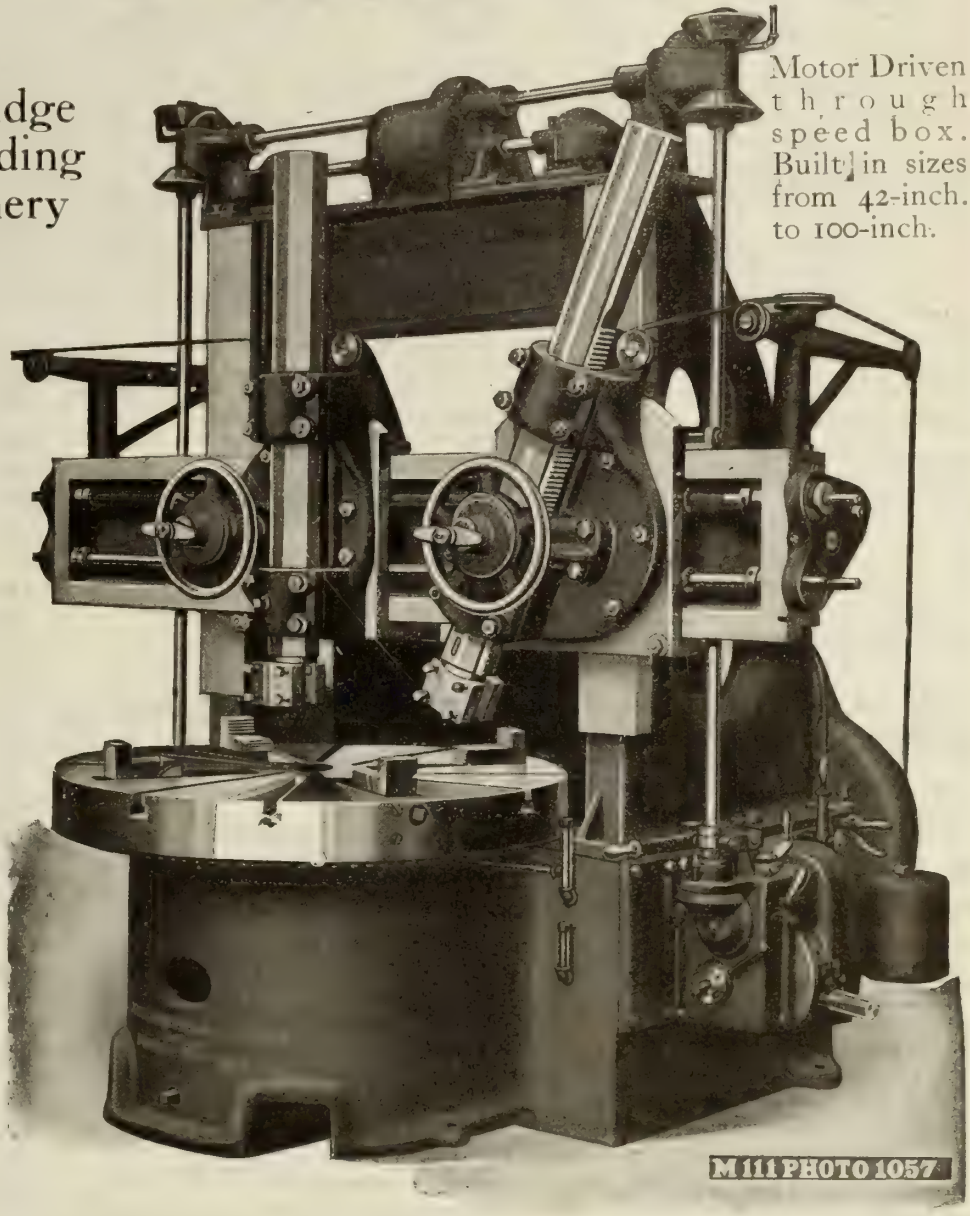
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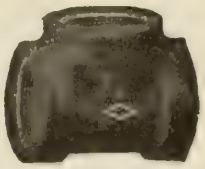
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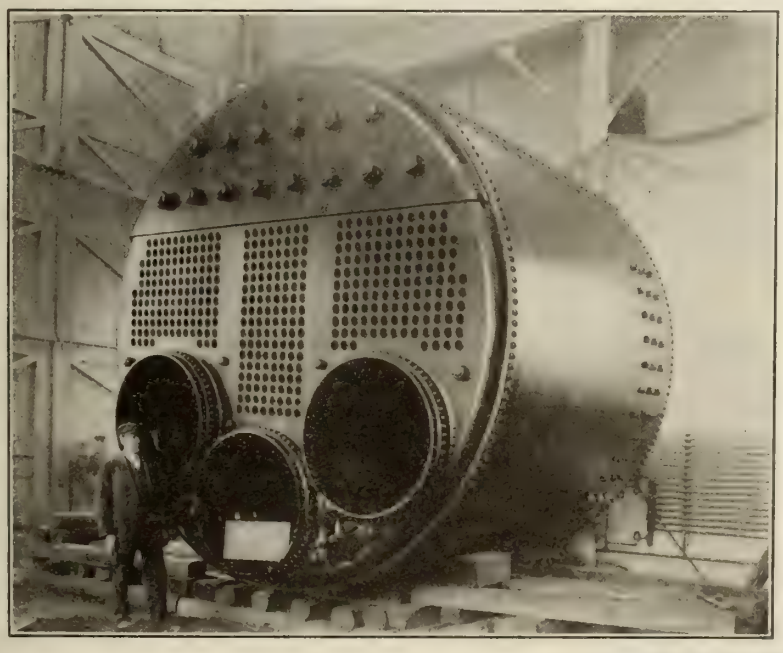
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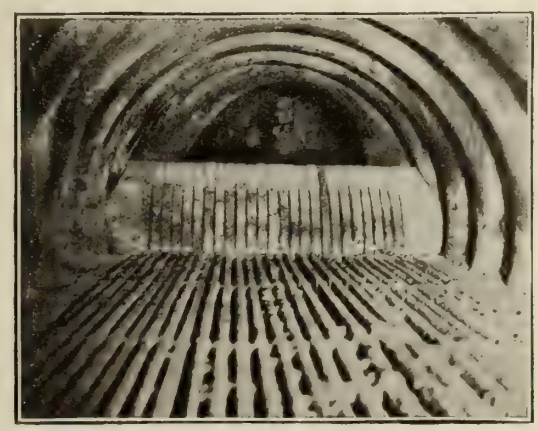
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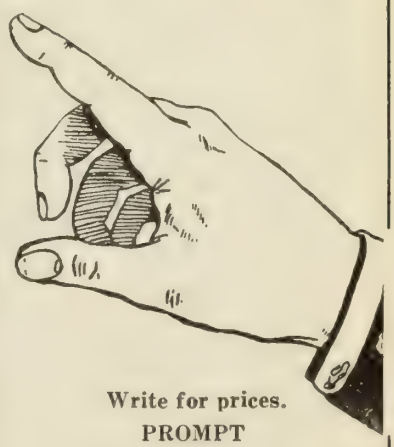
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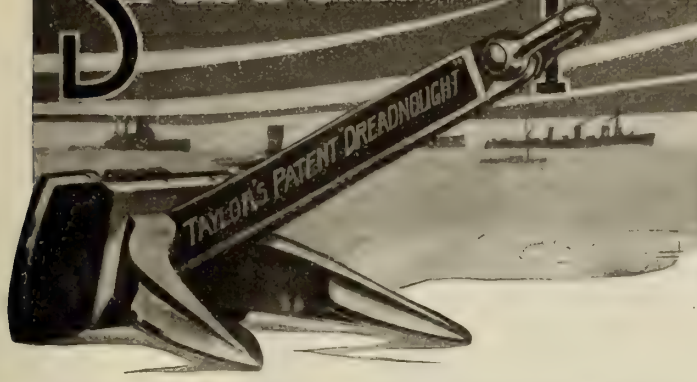
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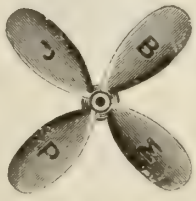
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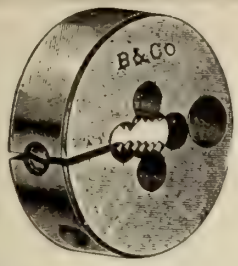
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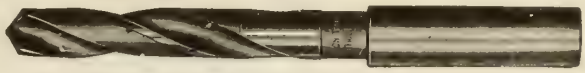
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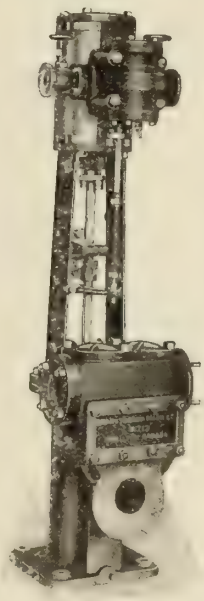
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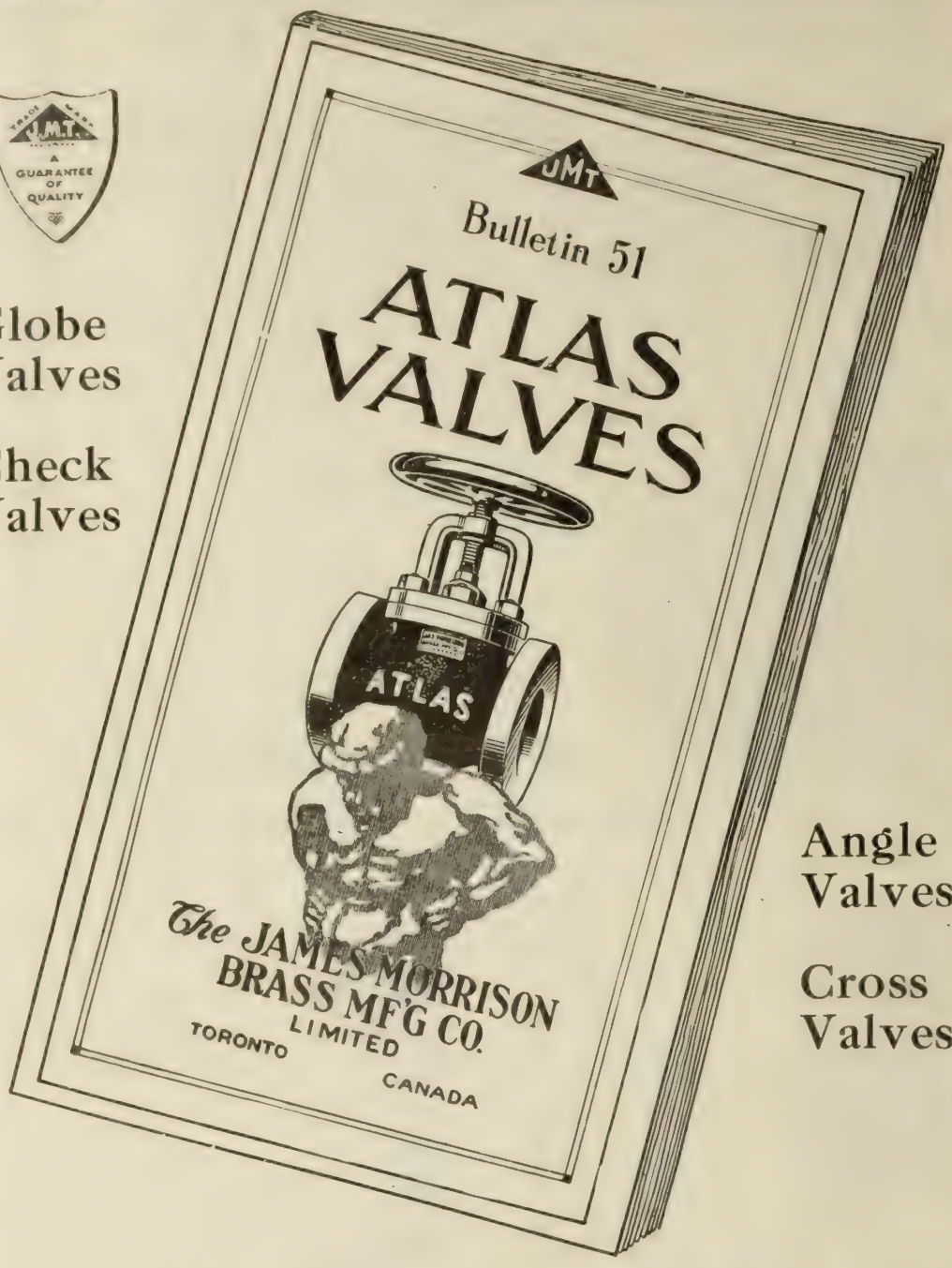
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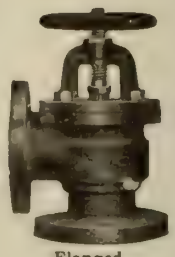
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Fig. 11-51


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Fig. 5-51.

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Fig. 2-51.

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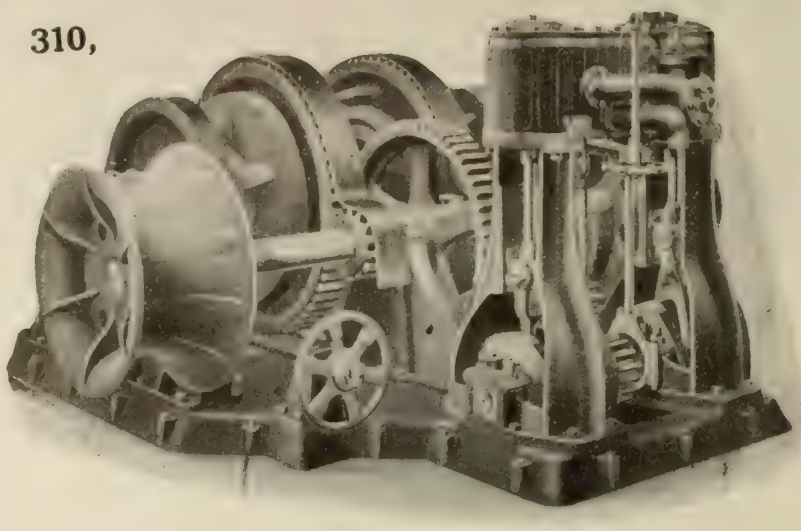
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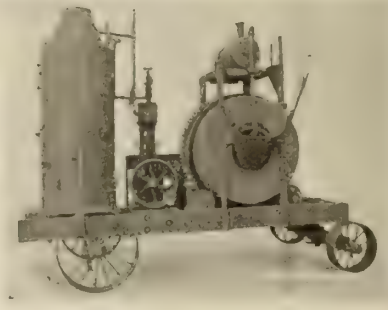
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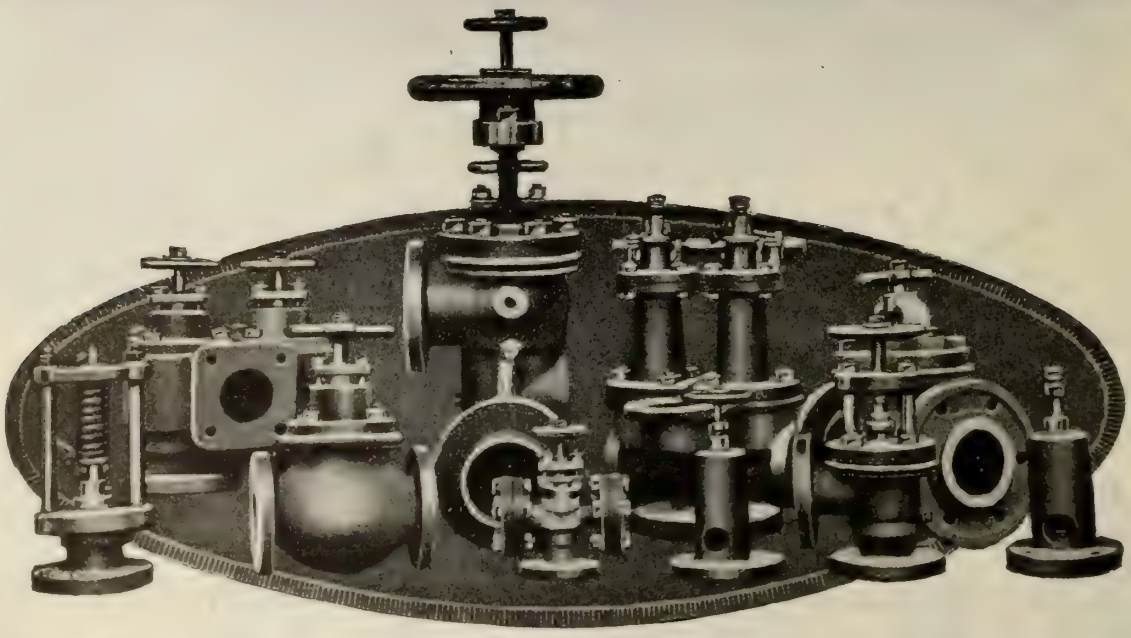
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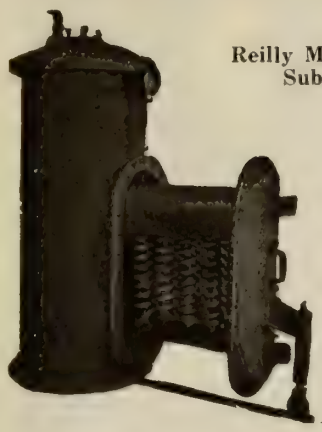
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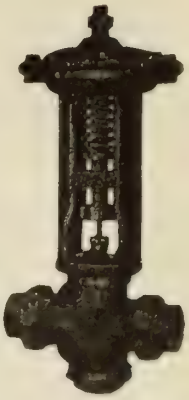


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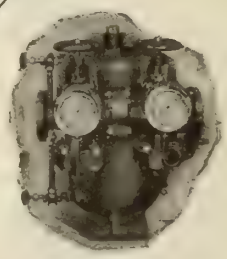
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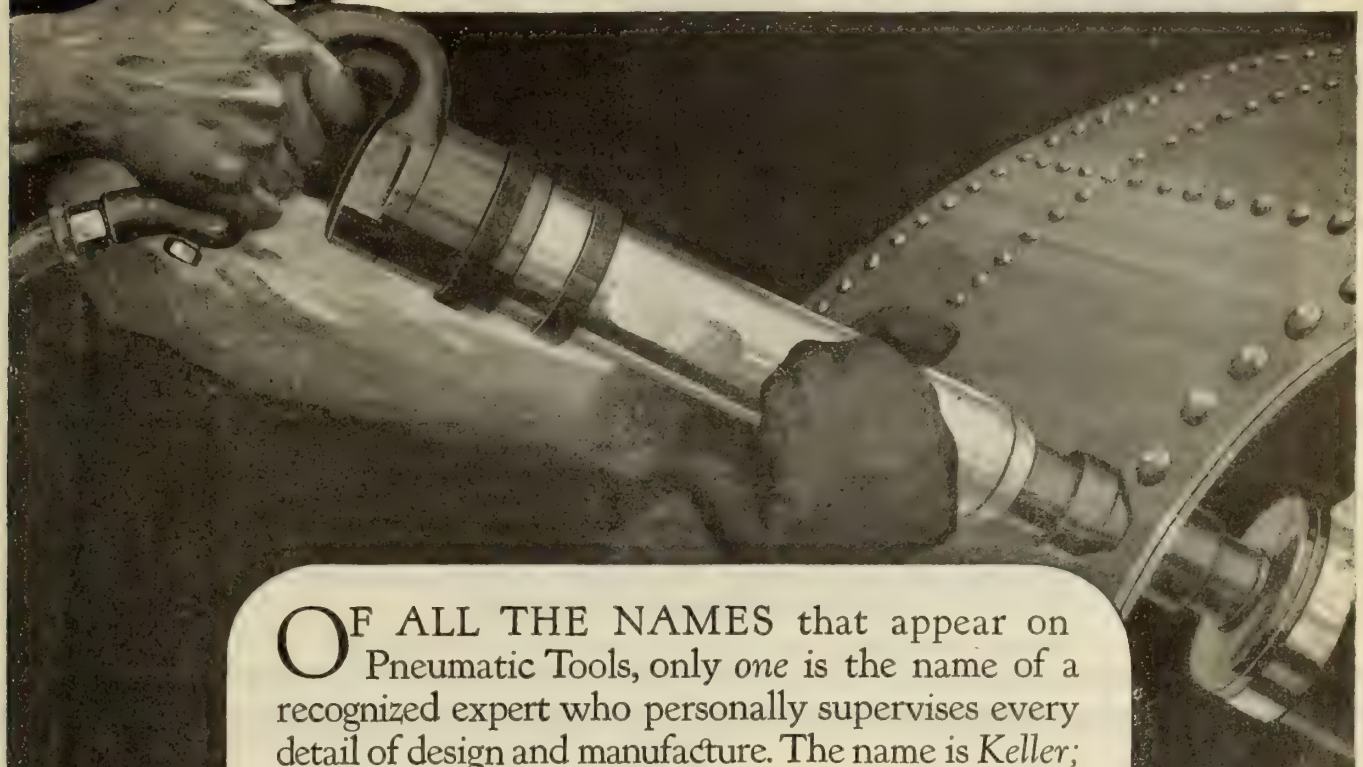
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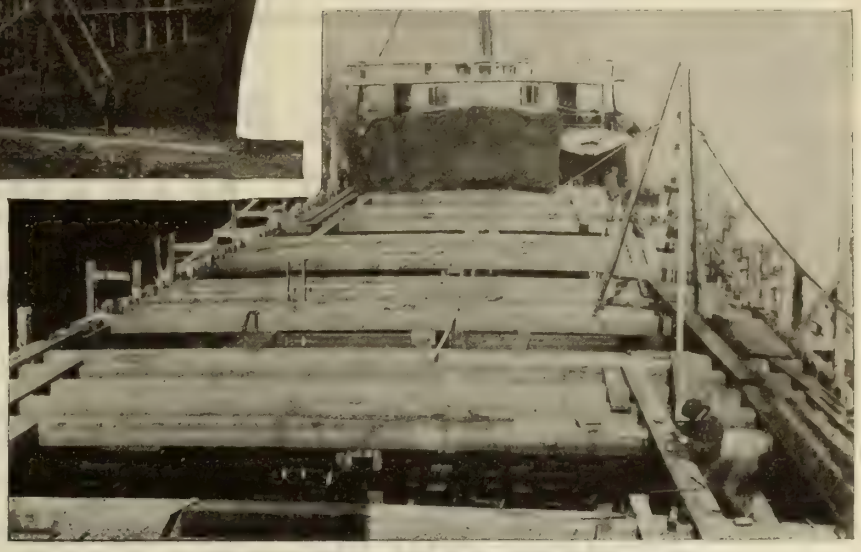
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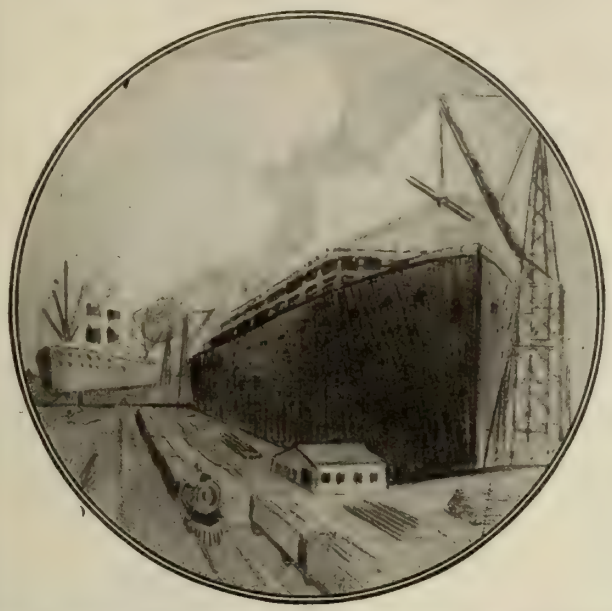
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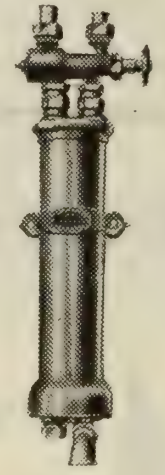
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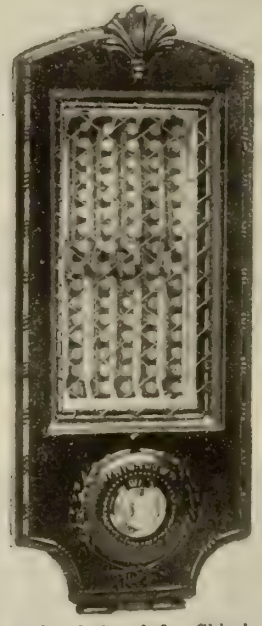
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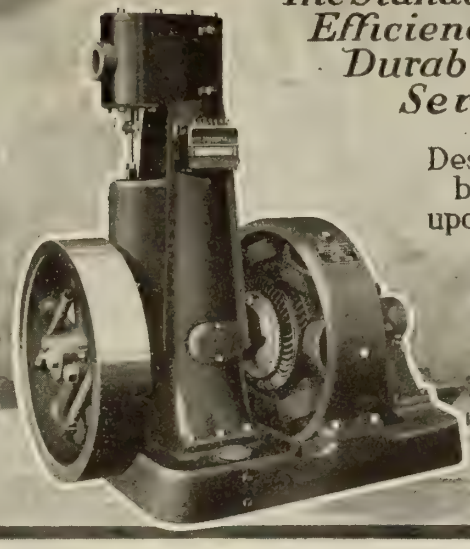
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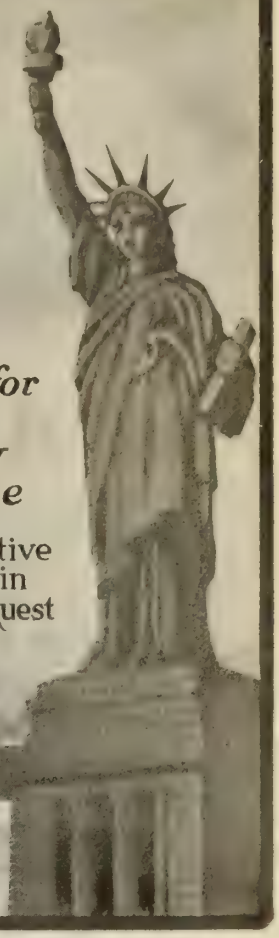
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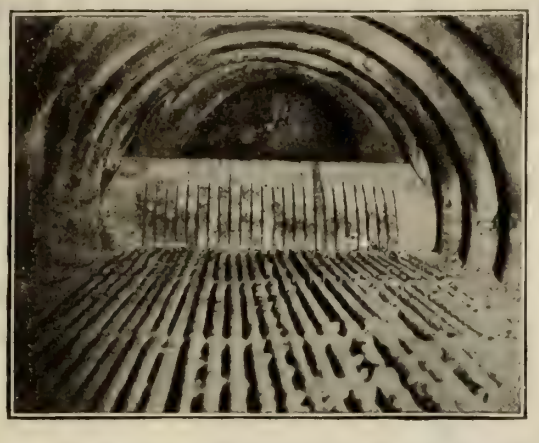
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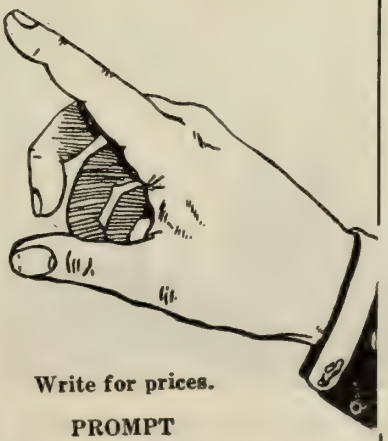
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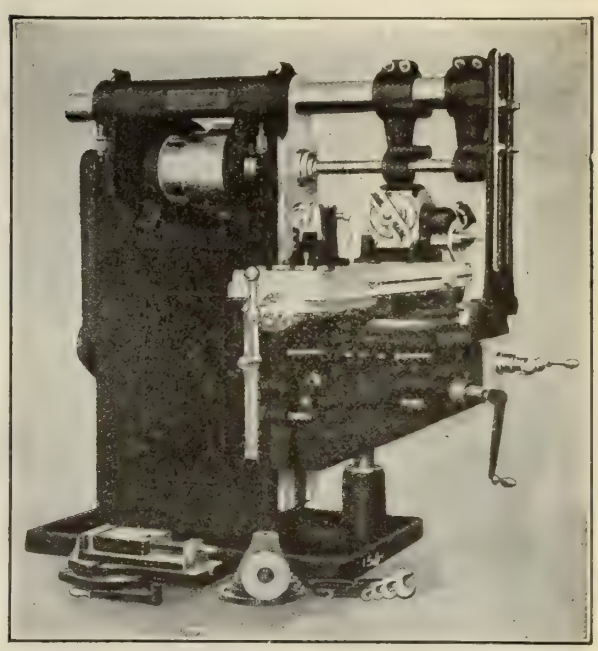
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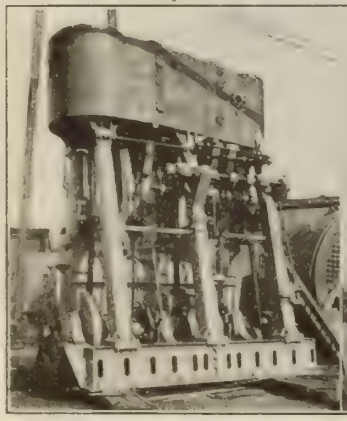
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Length Overall 385 ft.

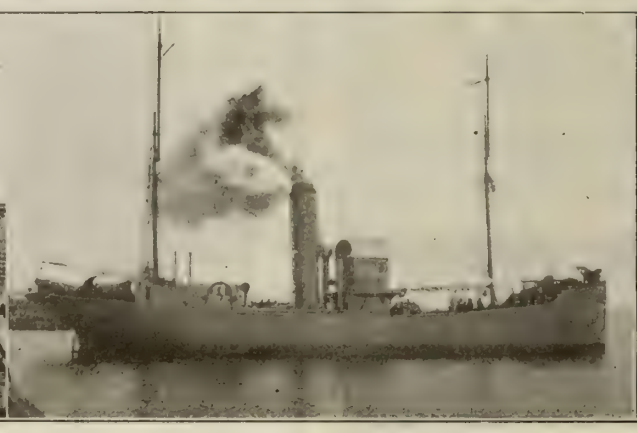
Breadth Moulded 52 ft.

Depth Moulded 28 ft. 9 in.

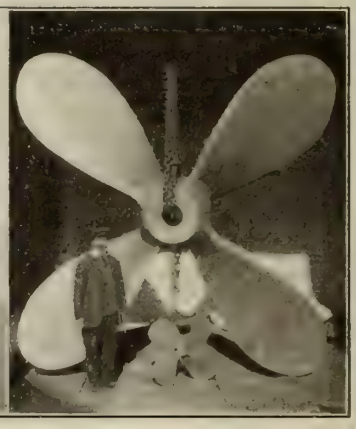
Gross Tons 6,905



1500 H.P. Engine, Triple Expansion



Fourteen of these Trawlers for Dept. of Naval Service



Wheel Casting 14 ft. 9 in diameter

W. Grant Morden

coaling at C. N. R. Coal Docks, Port Arthur.

Built at Port Arthur Ship building Company, Ltd. Year 1914.



Bulk Freighter

Length Overall 625 ft.

Breadth Moulded 59 ft.

Depth Moulded 32 ft.

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DRY DOCK 700' x 93' x 16'
Four Building Berths

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PORT ARTHUR, ONTARIO

MARINE ENGINEERING
and
Canadian Merchant Service Guild Review

Volume IX. TORONTO, SEPTEMBER, 1919 Number 9

Two-Cycle Opposed Piston Doxford Oil Engine

This Engine Has Been Changed From a Diesel to a Hot Bulb Engine—The Firing Is Accomplished by a Novel Arrangement of Piston—"The Engineer" Describes It in Full.

IN our issues of Dec. 25, 1914, and Jan. 1, 1915, we described an opposed piston Diesel engine constructed by William Doxford & Sons, Ltd., of Sunderland. The principle of the engine has now been revolutionized to the extent that the engine is now no longer a Diesel, but a hot-bulb engine—granted that the hot surface of such an engine need not be of bulb form—whilst a solid injection of fuel is now used.

A few historical details may be desirable. As long ago as 1912 Messrs. Doxford built a single-cylinder unit of 250 brake horse-power of quite new design, but embodying the usual heavy cover, etc. At that time the very mention of the word "cover" in connection with the Diesel engine used to raise a host of doubts, justifiable or otherwise, and the builders sought means of avoiding its use. By the end of 1914 they had a second experimental engine running, but it was of the Junkers opposed piston type with cylinders 500 mm. diameter and two strokes of 750 mm., with no covers and with other advantages, with which we dealt at the time. It may be remembered that we were afforded an opportunity of watching the dismantling of this engine after a practically non-stop run of thirty-three days and examining the condition of the parts as duly reported at the time, and we summed up our observations by expressing the opinion that "this engine is quite the most promising two-cycle engine proposition before us." We held then that the results were sufficiently good to warrant the builders in putting a multi-cylinder engine in hand, little thinking at the time that one of the objections with which we qualified our opinion would be the cause of further delay, though we do not, of course, claim that that qualification had the least effect upon the attitude of the builders. We objected, in fact, to the very high blast air pressure of 1,500 lb. per square inch which the builders had found to be desirable in order to obtain the best results, and suggested solid injection of the fuel as a means of eliminating what might, in the minds of some purchasers, be considered to be an insuperable objection. As a matter of fact the builders did not consider good to be good enough, and they embarked on a further series of experiments, the injection of fuel direct by the pump without the intervention of any air blast being the first point to be tackled. Without following them through the various stages of their experiments, we may say that the arrangement now is that three rams are used as the fuel pump, driving through small cranks on the cam shaft set at 120° so that the work may be divided over the revolution and so save a single very heavy shock if one ram were used. These rams force the oil into two small air vessels—initially charged with air at a pressure of 1,000 lb per sq. in. —at a pressure of 8,000 lb. per sq. in. This device, it is interesting to note, is covered in one of Dr. Diesel's patents of some twenty-seven years ago, and it is, to our mind, almost the most obvious, simple, and mechanical method of taking up the pulsations of the pump and storing the fuel at the requisite pressure pending the opening of the fuel valve. The pumps themselves, needless to say, are a very beautiful bit of work; so good indeed is the fit that no packing is required even at this enormous pressure, the leakage representing little more than an overflow of lubricant, and it can, of course, be collected and returned to the fuel tank without waste. This end has been reached by a departure from the ordinary method of driving the fuel pump, which is from an eccentric with a very short rod directly coupled to the end of the ram, a form of drive which causes severe side thrust on the ram and eventually leads to wear and so to leakage. In its place Doxfords fit a slotted crosshead with a sliding block for the driving pin to work in, the crosshead being carried in very closely-fitting guides at each side. The plunger is connected to the crosshead with an ordinary union nut, so that, provided the centre lines are parallel, which, of course, can be insured, any want of exact concentricity may be allowed for and the thrust of the ram must be absolutely axial.

The fuel valves present a new feature in that they have only a very light spring to keep them on their face when the engine is not running. The size of a spring strong enough to keep them closed against an oil pressure of 8,000 lb. per square inch when working would, it may be well imagined, be on the heavy side, but if 8,000 lb. will blow the valves off their faces it will equally well keep them on if applied to a larger diameter, and this is, in fact, the plan adopted, again with unpacked plungers.

The elimination of the blast air makes a complete alteration in the conditions inside the cylinder. In the old form the fuel was blown in by air tangentially on opposite sides of the cylinder so as to create a whirling action or turbulence. With no air, but only a solid jet of fuel, no turbulence can be obtained, so that the fuel must be diffused as much as possible, and the valves are now arranged opposite to each other, but one above the other so as to cover as large a volume of air as possible. The form of the nozzle is a very clever bit of work, involving electric welding on a small scale in order to obtain a good water jacket right up to the jets; but more

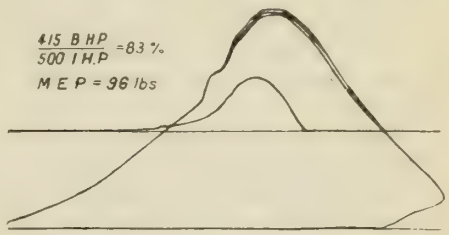


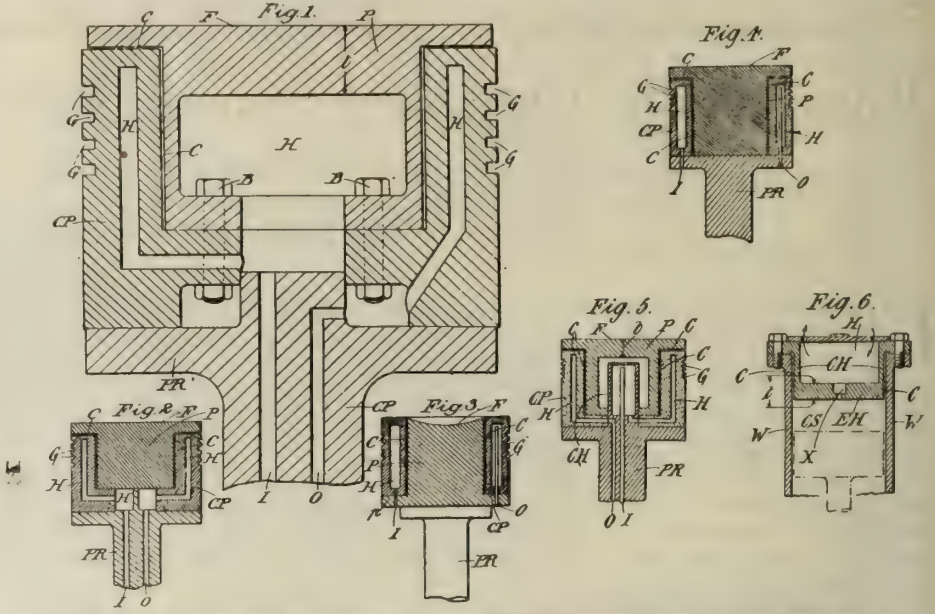
DIAGRAM OF SUN'S POSITION

we must not say. The jets themselves are arranged to spray the fuel fanwise across the cylinder, and microscopic little things they are, made on a miniature lathe which, when not in use, is kept locked up in a little box. A sight of this delicate little tool brings home to the mind of the observer the great contrast between the quality of work customary in the old steam engine days and that called for in Diesel engine work.

We must now justify our statement that the engine is no longer a Diesel but a hot bulb engine.

The accompanying indicator card—Fig. 1—taken with the top of the stroke in the centre of the card instead of in the usual manner, shows that the compression pressure used is only 300 lb. per square inch, but that the combustion of the fuel carries the curve fairly on

up to 500 lb. an appreciable time after passing the dead centre, so that there is neither the 500 lb. compression pressure nor the constant pressure combustion of the Diesel engine. The fuel valve lift diagram embodied on the same card shows very clearly what is actually taking place. This compression pressure of only 800 lb. per square inch would certainly not give a sufficient rise in temperature to fire very heavy oils such as the Mexican fuel oil which is being used and, in fact, the engine will not start with all cold. To start it hot water is circulated through the jacket for about twenty minutes before starting up, and raises the temperature of the liner, etc., to about 140 deg. Fahr. The engine then fires readily, and we found that the temperature of the water on leaving the jacket when the engine was running on normal load is about 170 deg. Fahr., while that of the entering water is about 140 deg. Fahr. In practice, the same water is circulated round and round, only being cooled by means of a small cooler to the extent of about 30 deg. This brings us to what is, to our mind, a remarkable feature of the whole engine—the piston temperature. Hitherto the problem has been to keep the piston cool, but Messrs. Doxford make every effort to allow the crown to reach a temperature of no less than 1,000 deg. Fahr., and it is the piston crown which forms the hot surface which really fires the charge with heavy oils.



FIGS. 1-5.—DIESEL ENGINE PISTON WITH PLUG MAINTAINING TEMPERATURE OF 800° F. FIG. 6.—CYLINDER HEAD DESIGNED FOR SAME PURPOSE.

Dealing with the patented design as it applies to this type of engine, and referring to Fig. 1, it will be noticed that there is a large plug (P), which exposed at one end to the combustion chamber and to the hot gases, and is bolted at its inner end with the cylindrical portion (C P) of the piston, this being secured to the top end of the piston rod in any convenient manner. In the cylindrical portion of the piston rod are the usual grooves (G) for the piston rings, and in other respects there is no novelty in the design.

There is a large water space (H) for cooling both the cylindrical portion of the piston, the bolts holding the piston to the plug and the bottom of the plug, but the thickness of the plug "t" is sufficient to prevent the cooling water lowering the temperature of the plug at its outer face (F). There is a clearance (C) between the plug and the cylindrical portion of the piston, which allows expansion and contraction of the plug without causing any undesirable stresses in the piston. The plug should be preferably of mild steel, while the piston can be of cast-iron of suitable mixture. In an opposed-piston engine each piston would be designed in this way, whilst in the ordinary Diesel engine the cylinder cover will have a plug instead of the piston, the piston being of normal design. This is illustrated in Fig. 6, whilst Figs. 2, 3, 4, and 5 show alternative arrangements with the opposed-piston type of motor.

Apart from the advantages of lower compression pressure, as mentioned above, it is claimed that with this design, since the high temperature is maintained throughout the whole of the stroke, the efficacy of combustion does not fall off, which is liable to happen with the usual type, especially if solid injection is employed with heavy fuel oil. It is for this reason that with solid injection it is the custom to use the lighter grade of fuel oil.

This engine has been running with the various features described above for some months and complete consuming Mexican fuel oil which contains, we hesitate to say what percentage of asphaltum, but something very high, with absolutely clean exhaust. It will be gathered that the injection of fuel is prolonged for an appreciable time by means of a suitably formed cam, while the hot water jacket reduces the losses of compression and must tend to economy. With this engine the consumption is, as shown on the attached test chart, 0.42 lb. per brake horse-power per hour, as against 0.43 lb. of the engine running on ordinary Diesel lines, but the mechanical efficiency has risen from about 74 per cent. to about 83 per cent. in the single-cylinder engine owing to the elimination of the high-pressure air compressor for blast injection, which, of course, had to be driven by the main engine. Thus the fuel economy alone is quite appreciable, but the saving in first cost, weight and maintenance is probably of even more importance, though the builders hope in some further experiments which they have in hand to reduce the consumption per brake horse-power very appreciably below the above figures. At present they are proposing to use a mean effective pressure of 90 lb. per square inch as a standard, though tests have been made at a mean effective pressure as high as 140 lb. without any trouble being experienced; there really seems to be no reason why that should not become the standard pressure when the piston crown thickness and the working parts, etc., are designed accordingly and more experience has been gained. Then the horsepower per inch of cylinder diameter should be such as to render the oil engine suitable for almost the highest powered ships. As the engine now is—a single cylinder unit—it runs extremely slowly; in fact, we timed her

TEST CHART NO. 21—SOLID INJECTION.

Date	Duration of test.	Reading of speed counter. Start.	Stop.	Total revs.	R.P.M.	Brake load. Weight in lb.	S.H.P.	Indicator load. No. cards taken.	Average Pm. 92 lb. per sq. in.	I.H.P.	Mexican fuel oil 0.9 S.G. Mech. eff. B.H.P. I.H.P. Per cent.	Fuel consumption. Lb. per hour.	Lb. per S.H.P.	Lb. per I.H.P.	Injection oil press Lb. per sq. in.	Max. press.
21-1-19	33′ 41″	2,250,911	2,254,703	3792	112.5	1700	382	4	6.47	469	81.5	160.5	.42	.342	8200	44
23-1-19	33′ 48″	2,254,703	2,258,497	3792	112	1700	381	3	6.38	461	82.8	160	.42	.347	8200	44
23-1-19	31′ 41″	2,261,700	2,265,276	3576	112½	1800	405	4	6.835	491	82.6	171	.422	.349	8200	46
23-1-19	31′ 50″	2,265,276	2,268,839	3563	112	1800	403	3	6.85	495	81.5	170	.422	.344	8200	46
23-1-19	29′ 53″	2,269,631	2,272,993	3362	112½	1900	428	3	7.2	523	81.8	181	.423	.346	8600	48
23-1-19	29′ 50″	2,272,993	2,276,338	3345	112	1900	426	3	7.18	519	82	181	.425	.349	8600	48
23-1-19	27′ 44″	2,276,924	2,280,053	3029	112.8	2000	451	3	7.53	548	82.2	194½	.432	.355	8600	49
23-1-19	27′ 17″	2,280,053	2,283,146	3093	113½	2000	453	3	7.55	552	82	198	.437	.359	8600	49

Cooling water, inlet 147 deg. Fah. Cylinder water outlet, 170 deg. Fah. Oil temperature 110 deg. Fah.

at 22 revolutions per minute with the exhaust remaining quite clean.

We were interested to note that a new and softer packing which will stand the comparatively high temperature of the circulating water has now been discovered for the oscillating arms of the inlet and outlet water pipes, and that they are giving no trouble and were quite tight when we inspected them. The telescopic arrangement for the top piston which we criticized in our previous article is, however, still troublesome, and it will not be used in future designs.

We shall look forward with the greatest interest to the trials of the four-cylinder unit which the firm now has under construction, and which is to give 3,000 indicated horse-power at the very practical speed of 77 revolutions per minute with cylinders 580 mm. diameter and a total working stroke of 2,320 mm., though it will probably not be ready for trials until some time in the winter.

FIFTY YEARS AGO

Salvage methods have greatly improved in the last fifty years, for there was a good deal of difficulty at Liverpool in 1869 over the casualty to the well-known East Indian clipper, "Flying Venus," of 1,893 tons. The ship—which had been built some fifteen years previously at Blackwall by C. J. Mare & Co., being one of the early iron sailing vessels—completely capsized on the 3rd of August in the Wapping Dock after her discharge. There was no loss of life, but it was decided that the dock must be emptied before she could be righted again.

On the same day the SS. "Propontis"—an iron steamship which belonged to Messrs. John Dixon & Son, put back into the Mersey on account of serious damage sustained by an explosion in her forehold whilst she was outward bound to Constantinople. This vessel was subsequently fitted with an early set of triple expansion engines.

At this time there was lying in the Great Float at Birkenhead, a vessel which had achieved the highest fame in the North Atlantic. She was the famous Cunard iron paddle steamer "Persia," which a dozen years before had been built by Messrs. Robert Napier & Sons, of Glasgow, who had built the engines of the previous mail steamers of the company, these all having had wooden hulls, because till the design of the "Persia" prevailed, the sapient British Post Office had not got over the shock of finding out that iron ships will float, and had therefore concluded that H.M. mails could not be trusted to a vessel built of that material. Great care and thought had been taken over the design of the "Persia," and she was probably the most beautiful ship of her day. At the time she was ordered, the ill-fated Collins line, with an immense subsidy from the United States Government, was out to run the Cunarders off the Atlantic. Their final ship was the great wooden paddler "Adriatic," and the "Persia" was the counter-stroke to her appearance. The "Adriatic" came on the scene too late to save the Collins line, whilst the "Persia" became a record breaker and the favorite liner of her day. But by 1869 that day was over, and early in the year she was sold to a Mr. McArthur, of London, who left her at Birkenhead till such time as it should be convenient to remove her machinery. On this same 3rd of August the workpeople removed a plate over a valve in the vessel's skin, whereby she, too, sank in dock. She was afterwards raised.

On the 10th of August another favorite New York liner was launched at Glasgow by a firm of, in those days, great renown—Messrs. Tod & McGregor. This was the Inman liner, "City of Brussels," of 3,000 tons and of over 400 ft. of length. She had accommodation for 800 passengers, and was fitted with steam steering gear, being the first regular liner on the Atlantic to have this innovation, though the experiment of steering by steam had been tried with the "Great Eastern," some years previously. To modern ideas this was the day of small things, for, when she was a dozen years old, the "City of Brussels" broke the record for a weighty mail—she was the first vessel to shift as many as 760 sacks at once. A couple of years after this achievement her career was cut short, and she herself went to the bottom of Liverpool Bay by a collision with the SS. "Kirby Hall."

Smaller and older than the "City of Brussels" was the first "City of Paris," which had come from Tod & McGregor's yard in 1865. She was 33 ft. shorter than the "Brussels," though the same beam. She may be mentioned here and now because on the 14th August, 1869, she embarked at Liverpool H.R.H. Prince Arthur, who to-day is still with us as the Duke of Connaught. The Prince was crossing to Canada to join his regiment at Halifax, where at that time we still maintained a garrison.

At conferences and places where they talk, the Hun has ever been in evidence with fine words and benevolent suggestions. During the month of August, 1869, societies for the aid of the sick and wounded in war held a congress at Berlin, and during their meetings the suggestion was put forward that the maritime nations should agree upon an international distress signal which could "be used both in peace and war." Commenting on the suggestion, the "Militar-Wochenblatt" wrote that "it was recommended that a dark yellow flag with a red cross be introduced for the purpose, and that all civilized states be requested to acknowledge it."

During the years 1914-1919 there have been many seamen in distress—some fifteen thousand unarmed British merchantmen have gone down to their deaths at sea—mostly in the presence of Germans. Yet we have no record of any attempt by a Hun sailor to save a life of a single distressed seaman. So we must assume that in the half century that has passed since this Congress was held at Berlin, the great German nation must have outgrown that foolish civilization which prompts men to rescue their fellow creatures from the raging waters.

A romance of the sea came to light in August, 1869, when some distressed fishermen landed on Tiger Island, a very desolate and unfrequented place in the Bay of Bengal. Proceeding inland a little they came across two wrecks, which proved to be the remains of the ship "Morayshire" and of the steamship "Thunder," both of Calcutta. These vessels had been missing for two years, and it was supposed—as now proved to be the fact—that they had been victims of a cyclone which raged in that locality at the time of disappearance. No trace of crew or passenger was ever found, but, and this is the romantic part of the story, bullion to the value of £165,000 was discovered in the hold of the "Thunder." The tale should give heart of grace to those treasure-hunters who have so much faith in what is to be found in Tobermory and Vigo Bays.—"Marine Engineer and Naval Architect."

TO SELL MECHANICAL PROGRESS

It is the opinion of many acute business men that commercial method and proficiency must be raised to a higher plane to balance the recent extraordinary advance in British technical knowledge and skill, especially in the departments of engineering and chemicals. For the time being applied science as exemplified by inventions and improvements affecting transport by land, sea and air, higher efficiency in the factory and the farm and public and private social convenience has gone ahead of the commercial system which ought to open markets for these inestimable advantages. The world is to some extent waiting for an equivalent effort of higher salesmanship. It is partly to meet such new conditions that a scheme involving an expenditure of about half a million sterling is being organized by London University for complete commercial training in all the operations of commerce. It is intended that students shall have the opportunity of taking a degree in due course, and while on the one hand generous donations to the fund are being made by leading business houses, their directors have also intimated that they will be ready to take students on their staff at good salaries as soon as they are qualified.

Cleveland.—The steamer Van Hise, which was the centre of interest for a time, due to the novel method by which she was passed through the narrow locks last fall, has changed hands. It will be remembered that the vessel, in order to get down to salt water, was cut in two in the usual way, but was too wide to get through the locks. The difficulty was overcome by turning the half vessel on its beam ends. The new owners are the Morrow Steamship Company, who have purchased her from the United States Shipping Board. The original owners were the Pittsburgh Steamship Company, who sold her to the Shipping Board for $640,000. The latest price is not revealed.

Shipmates with a Lunatic

By T. H. FENNER

"A MAN who "follows the sea" for a profession even in the piping times of peace must, in the course of events, meet strange experiences. These are sometimes concerned with things inanimate and sometimes with men. It is one of the latter that this little tale is written of.

One fine spring day in the distant past of nearly two decades ago, the writer stepped out of the Board of Trade offices in Liverpool, the proud possessor of an official blue slip. This slip was the Board of Trade surveyor's acknowledgment that I was entitled to a certificate of competency as a second class engineer. I have obtained higher qualifications since, but none of them brought quite the same thrill. Well, in the usual course of events, the blue slip was exchanged for a parchment certificate, and then followed a spell of life, liberty and the pursuit of happiness. This inevitably brought the cycle round to the stage where getting away to sea again became a necessity.

It was surprising what little effect the brandishing of my pretty new certificate had on superintendent engineers. Here was a huge seaport, with hundreds of steamers in its docks, all holding possibilities for a smart young engineer, and none of them awake to the opportunity. I was, of course, aware of the fact that I could not hope to get a position as second engineer, but I thought that I could almost pick my job as third. However, after a few days spent in interviewing cold and sceptical superintendents, my sense of proportion came to life for the first time since receiving my certificate. I realized that I was not so much after all.

Financial matters rapidly approaching a crisis, I started forth again in a much-chastened frame of mind. I had turned down several offers to go fourth in five-handed jobs, or, to put it into clearer language, in a ship carrying five engineers. I would look up some of these again, and if not already filled, would take one.

Of course, the objection to these jobs was that my time at sea would not count for my first-class certificate. That's why I wanted to get as third in a ship carrying more than three engineers. My time for my second's ticket had been put in as fourth, and I didn't want to sail fourth again.

There was one steamship line I had not yet tried. They had a number of steamers running in the Mediterranean trade, and they also had a hard reputation. The ships were not very big, and most of them carried only three engineers. It struck me I might get a position as second with them. Sometimes a man got a position as second while holding only a second-class certificate. Why not I? Finally I got courage up sufficient to tackle the superintendent. After the usual trouble and delay incident to seeing a superintendent engineer in those days I was admitted to the august presence. This was encouraging, for the mere fact that one could get so far augured well. The conversation that ensued was brief, and somehow finally centered on the point that the company had a ship, and the ship was at that moment in need of a second engineer. I gathered that, through an unprecedented dearth of suitable second engineers, the superintendent was willing to try me. In doing so he made it clear that he was breaking a life-long rule, and could see nothing but disaster in front of him, but he was going to chance it. I was deeply affected, and, with tears in my voice, asked what was the pay. To my great relief he named a figure that was the equal of the rate paid by any company sailing out of Liverpool.

Well, she was sailing the next afternoon, and I had to get my dunnage aboard and sign on at 11 o'clock the next morning. I left the office with my ego once more in full standing, and, just outside the door bumped into a pal, to whom I imparted the joyous news. His reception of the tidings was startling. "Old ———," he said, "ought to be hung or jailed for manslaughter." This gave me to think, as the French say. "How's that?" I queried anxiously. "Well, old chap," he replied, "that old hooker has broken the hearts of more seconds than any ship sailing out of Liverpool." He went on to tell me of her peculiarities, but I knew now how I had happened to get the job. However, I was young, strong and optimistic, and wasn't going to be scared. Furthermore, the money looked good, and the Mediterranean trade has attractions of its own. So I signed on.

I found that, whatever the ship might be, my fellow officers on deck and in the engine department were good fellows. The old packet was all my friend had said she was, and then some, but I am not going to describe her cussedness here. It will be fit subject for another yarn some day, but it will keep. I made the voyage in her and found, that by remembering the fun we had in the Mediterranean ports and forgetting the time at sea, everything was fine, so I signed on again.

Now, the captain, officers and engineers were the only British members of the crew. The company made a rule of manning their ships entirely wtih Spaniards, and practically ran a Spanish sailors' boarding house in Liverpool. This was where they secured their men, and one thing I will say, they were good men. I picked up enough Spanish in the course of my first trip to give all my orders, and occasionally hold desultory conversations with the donkeyman. Later on I got fluent enough to make myself pretty well understood in the Spanish ports.

The men, whether firemen or sailors, generally knew their job, and if handled tactfully were willing and respectful After sailing with a stokehold crew of Liverpool Irishmen the change was delightful. This was especially noticeable in port, for the men were always at work on time, and absentees were nil. They went ashore at night, but came aboard about 12 or 1 o'clock sober. They were not by any means prohibitionists, but they drank only wine, and were usually quite well-behaved. Occasionally their hot tempers would flare up and a knife be drawn, but these incidents usually closed with little damage.

After we got away to sea on the second voyage I happened to notice one of the sailors who looked different to the rest. He was short and heavy built, and had one of the ugliest faces I have ever seen. He wasn't a Spaniard, and didn't exactly look like a Malay. It turned out he was a Philippino.

I took the four to eight watch, being second engineer, and the donkeyman took the chief's watch, from eight to twelve. Coming down to relieve me, the second or third watch after we left, after making the rounds of the engine room, and reporting all right, he spoke to me. "Senor Secundo?" "Si Manuel," I replied. "Este marinero Philippino, senor. Him mucho malo," which in English signified that the Philippino sailor was a bad man. I laughed, but Manuel was much troubled, and insisted that he was a "hombre no bono."

After I was washed up, the chief and I were sitting in the latter's room having a yarn, when the mate came along. I mentioned the donkeyman's remark, and the mate said there had been a little trouble with the man, but he did not think much of it. The matter dropped. The following day a carrier pigeon pretty well played out, landed on our deck, and the chief, happening to be taking his afternoon walk, was quite close to it. He picked it up, and took it to his room, and went away to the steward to see if he could get some corn or other food for it. When he got back to the room our Philippino friend was there before him, looking at the pigeon, and mumbling some words to himself. The man had not been in sight when the pigeon

was landed, but he must have seen it. He was greatly excited, and absolutely unintelligible. The chief called up one of our men to interpret for him, and elicited the startling information that the sailor claimed the pigeon was for him, and had been sent direct from the gods with a message. The chief, instead of humoring the man, told the interpreter to make it clear to him that the bird was not for him, and that he had no right in the officers' quarters. He was ordered for'ard, and, after a long conversation with the man who was interpreting, went away muttering. That night, while the chief was sleeping, the pigeon disappeared. The disappearance was of course laid at the door of the Philippino, but as the bird could not be found, and none of the other men had seen it, we concluded it had got rested and flown from the open port.

The rooms in that ship were in an alleyway alongside of the engine room casing, on each side. The chief's, second's and messroom were in the port alleyway, and the mate, second mate, and third engineers in the starboard alleyway. It was the custom for the second mate to send a sailor along at a quarter to four to wake the mate, who came on watch at four. Similarly, the third engineer, who was on from twelve to four, came up to call me. The day after the pigeon disappeared passed quietly, and all seemed well. I turned in about 10 p.m. as usual, after a smoke and chat with the chief. Just after I turned in I heard a most unusual sound from the chief's room. He was shutting and locking his door. I didn't think much of it as he might have had some writing to do, and did't want to be disturbed. I fell asleep and knew no more until I was awakened by a tremendous punch in the back. I woke with a start, thinking there was another breakdown, and was half out of my bunk before I had my eyes really open. When they did open I didn't get any further out. Standing in the room with folded arms. and one hand grasping a knife, which looked to me about six feet long, was the "mucho malo hombre." His eyes looked like a cat's, and his face looked like the devil. This was a situation in which I had had no previous experience to guide me, but recognizing that the initiative lay with my friend, I preserved a masterly inactivity. To my great relief he looked hard at me for a moment, and then shook his head. "Primero?" was the one word that escaped him. My hopes of life took a fresh hold right away. "Si Senor," I said politely, "otracamara," which was, as near as I could get, to "next room." He turned immediately and stepped out, and as he went over the threshold I remembered the room was locked. I jumped from the bunk and peeped round the door. He was walking down the alleyway to the chief's room. I hopped out of my room, round the forward end of the alleyway, and across the fidley grating to the other side, where I woke the mate. I told him what was on, and he dived into his desk and produced two revolvers. He handed me one and kept the other. The plan was that we should go, one each end of the allayway and get the man between us. If he did not surrender, shoot. "Fine," I said, "but who will get the shot? Probably the three of us. Let's both go back the way I came, and he will probably scoot when he sees us." This was agreed to, and we stalked carefully round, but the game had flown. We knocked at the chief's door and told him who we were, and he opened. He said he had heard someone try the door and then go away. I asked him why he had locked his door in the first place. He looked sheepish and said he had felt a bit scared since the pigeon incident, and added rather warmly that the mate and been negligent in not confining the man. The mate, on his part, declared that he had none too many sailors, and he would rather take the chance of being minus a chief engineer than a sailor. This pleasant conversation was interrupted by a clatter of steel, and a yell of pain from the stokehold. All three of us made a break for the fidley, and rushed down the ladder, where we found one of the firemen stretched out with a badly cut head and a lacerated shoulder. Our amiable friend had seized the opportunity when the man was under the ventilator to drop a shovel down the chute. It was a miracle he wasn't killed. This settled it. The man had to be secured. It was now about 2 in the morning and pitch dark. We had no electric lights, and to carry a lantern round involved the probability of a stab in the back. We decided to go the bridge together, get the lookout man from the foc's'le head and then go forward and get all hands out. One man would have to go below and relieve the man that was hurt and then he must be brought up and some first aid given. Meantime the "old man" was called, and took charge. After getting the injured man fixed up, lights were secured from the engine room and bosun's store, and hung up all round the deck, till we looked like a mail boat. No trace of our man could be found, high or low, and after about an hour's search, it was concluded he had gone overboard, unless he had gone up the rigging, either of the fore or main mast. Sentries were, therefore, posted at the foot of the ratlines, at both masts, and daylight waited for. The lookout man went back to his post. and things quietened down.

I naturally went back and relieved the long-suffering third, who by this time was in a state bordering on hysterics. In this way I missed the denouement, but heard all about it after.

It seems that the lookout on the foc's'le head had not long resumed his post when he heard a peculiar noise coming from above his head. It was like something scraping on wire. He stepped to the centre of the foc's'le head to the foot of the forestay, and had just reached it when something came down the forestay at about sixty miles an hour, and knocked the breath clean out of him. The something was the crazy sailor, who evidently in fear of pursuit, had gone on past the crosstrees and shinned up the topmast till he reached the stay, and slid down it. He must have been a real sailor. When he came down the men at the foot of the ratlines saw him, and jumped for the foc's'le head, arriving there before he had picked himself up after the collision with the lookout man. They jumped on him, but he put up such a fierce fight that the noise reached the bridge, and more help was secured. Even then, the poor lunatic had to be knocked out before he could be fastened up.

He was placed in close confinement until we reached port, when he was subjected to careful medical examination. He was found to be a violent lunatic, which we knew perfectly well. The company had to pay his expenses back to England, where he was placed in an asylum.

This is one little incident that will always be fresh in my memory.

TRIUMPHS OF BRITISH SHIPBUILDING

It is known to everybody that the construction of new British naval vessels was carried through with feverish haste during the war, but the world is only now becoming acquainted with the remarkable results which were achieved in spite of the stress of war conditions. In peace time it is the custom of the British Admiralty not to accept vessels except after exhaustive preliminary trials. Naturally, also, it is customary for the shipbuilders to take minute care of every detail of the engines and other equipment. War production, however, reached so high a stage of efficiency that the Admiralty was able to dispense with these trials. High-powered vessels went to sea after a basin trial and steamed at full speed in a very short time. H.M.S Resolution, for example, steamed straight out into the North Sea before daylight, reached her full power within one hour, and ran without a hitch to her station in the Firth of Forth. Many battleships and cruisers went to sea fully commissioned, and ran the necessary trials on their way to the appointed naval base. One particular destroyer raised her full power within seven minutes of leaving the piers on her first voyage. Only marine engineers, who know how the trials of a well-built ship may be ruined by a trifling flaw in one of a multitude of details, can fully appreciate the meaning of this series of successful flying starts from the fitting-out basin. They form a magnificent tribute to the soundness of British engineering. Nothing but the best designs, the most accurate construction, and the most skilful assembling could have produced such a triumph.

Detroit.—The passengers of the steamer City of Mackinac have been transferred to the Tionesta of the Anchor Line in Mackinac Straits. The City of Mackinac is said to be in great danger, and latest reports say that she is breaking up.

Making the Pattern for a Four-Bladed Propeller

Being a Full Pattern, Follow Board, and Molding Box for a Propeller Wheel, 6 ft. 6 in. Diameter, 8 ft. Pitch, Right Hand

By J. A. McEWAN

THE accompanying notes are the result of actual experience in the making of a pattern, which was out of the ordinary for the shop in which it was made, but the results in the foundry were quite satisfactory, and the pattern was as fit for use after 40 castings were produced as at the beginning:

1. Make a model of one blade to

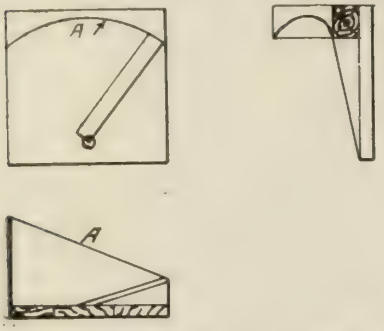


FIG. 1—BUILDING FORM FOR THE MODEL BLADE.

such a scale that the model blade will be no more than 10 or 12 in. long.

We decided to have the pieces put together like a spiral stair, or like a fan when it is partly opened out.

To do this you must have a form to build the pieces in.

2. Make a building form for the model blade, as shown in Fig. 1.

3. On the curved pitch surface A, lay off horizontal lines corresponding to the joints on the blade; these lines will also give the width of pieces required.

4. Right here is a point that might be overlooked. Let us call the pieces that are to be built up, the staves. Well, then, the staves will not do to be parallel in thickness, as one might suppose; they must be thinner on one edge than on the other. This is seen by referring to Fig. 2.

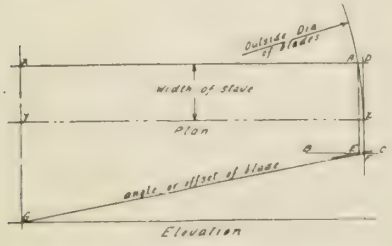


FIG. 2—SHOWING STAVES THINNER ON ONE EDGE THAN THE OTHER.

5. After building up the model blade, pare it to the slope and proper thickness on the back.

6. Lay off the shape of blade and draw in the line, but do not cut to this shape, as it is not necessary.

7. Make a full size form, as per Fig. 3.

8. Decide, off the model blade, as to the width for the full size staves, both at the centre and at the outside, and get out the staves, but do not taper them on the width till the thickness has been tapered. Cut them on the band saw on the outer end and make the inner end just to touch the centre.

Bore screw holes for screws to hold staves down when the glue is drying, being careful that the screws which are covered, towards the centre, are not in the way of paring operations afterwards.

Make up fresh glue and see that every joint is perfect, since there will be feather edges afterwards.

9. Be careful at the hub ends of the staves, for you can bandsaw a piece off on the angle and it will save a great deal of end wood paring afterwards. Pay close attention to the model, and note how the four blades will fit together at the hub afterwards.

10. After building up all four blades we struck the line of pitch on the ends of staves and pared and planed the face side, after which we did the backs.

11. Fit all four blades together. To do this properly we put one blade into the form, screwing it in place, after which we ran out a piece at right angles to the 1st blade and inclined up at the proper angle, upon which to rest the 2nd blade when fitting it to the 1st.

12. We screwed the blades together at the hub with 3 or 4 5-in. No. 18 screws in each one.

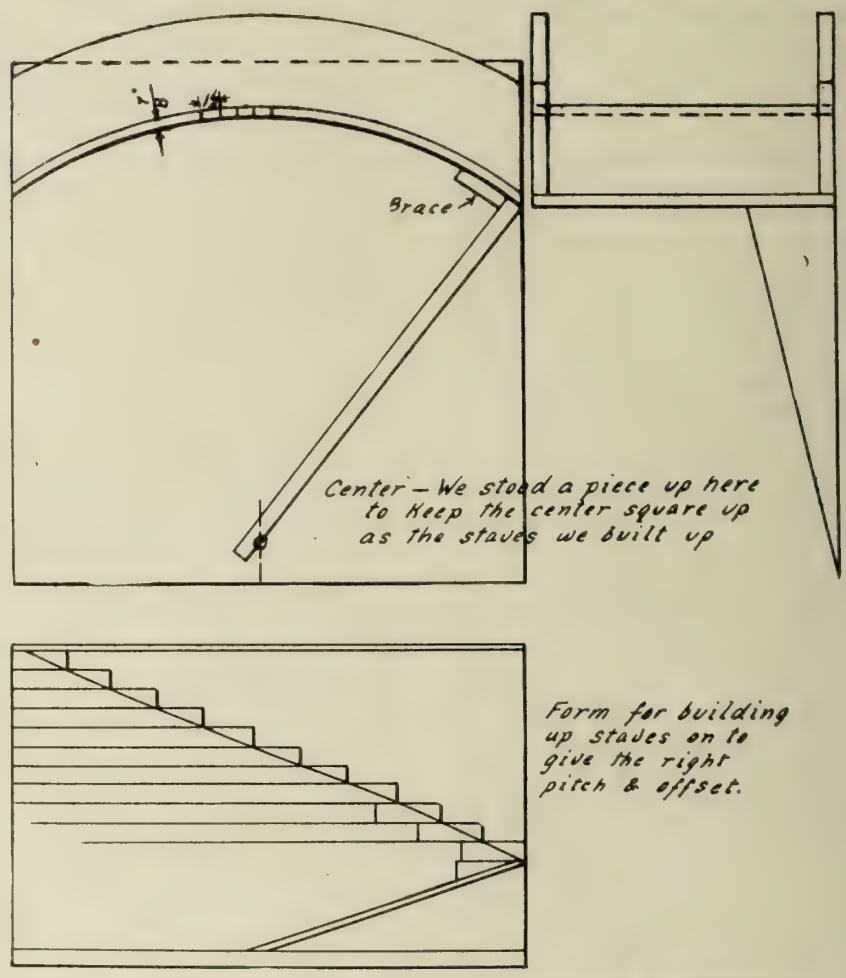


FIG. 3—SHOWS DIFFERENT VIEWS OF HOW THE STAVES WERE BUILT UP

13. Next we laid off the shape of blade on all four, and removing one we cut it and screwed it back on, doing the same with the rest. We did not glue them, but put 5-in. hard maple dowels in with thick shellac, two dowels for each blade.

Next we fitted pieces in the corners to get stuff enough for the hub.

14. After this we put ¼-in. round brass plates on each end of the hub,

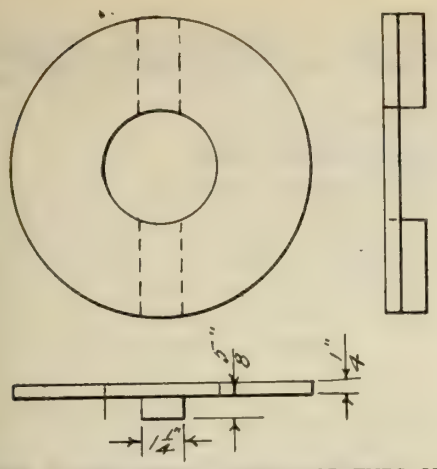


FIG. 4—CAST BRASS PLATES FOR ENDS OF HUB.

angling the screws away from the centre.

These plates were cast brass and were thickened up on opposite sides to ⅞ in. thick for more thread on the 5-in. tapped holes, which were on both ends. See sketch, Fig. 4.

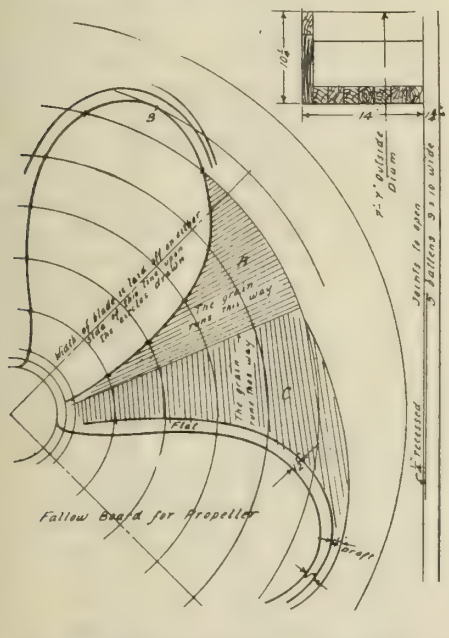


FIG. 5—MAKING THE FOLLOW BOARD.

15. The next step was to carve out the hub and the backs of the blades, but before we did this, in fact, before we put the blades together for the last time, we made the round board, 7 ft. 7 in. outside diam. upon which to make the follow board. This board was planed off true and it served as a face plate upon which to rest the pattern and the framing square when we were finding the parting lines on the hub.

16. After the paring and sandpapering was finished we screwed the joints on top and bottom of each blade—80 screws in each, 40 to a side.

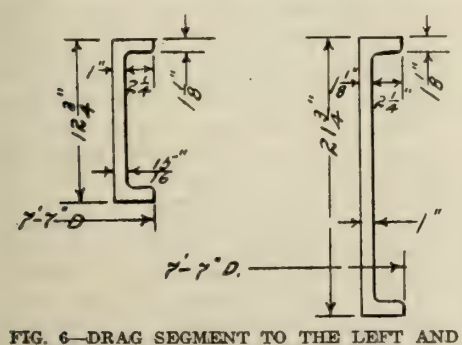


FIG. 6—DRAG SEGMENT TO THE LEFT AND COPE SEGMENT TO THE RIGHT.

Follow Board

17. The next thing was the follow board, which was almost more work than the pattern. Referring to Fig. 5 we recessed the hub down into the board ¼ in. to keep it central principally; we then decided on the level of the surface, where the drag rests, and built on the outer ring, using 3½-in. wire nails and 2-in. stuff, and screwing it to the board so it would come off while we built up the inner ring. After closing in the space between we laid the pattern in, glued up chunks for parts A and B, and fitted them in; then fitted supports underneath the blades down on to the follow board, after which we closed in with pieces C.

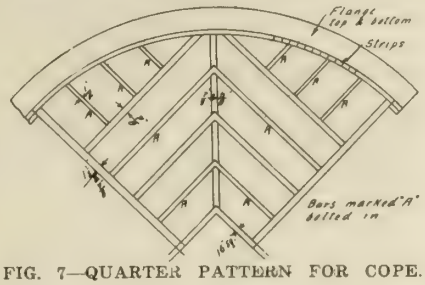


FIG. 7—QUARTER PATTERN FOR COPE.

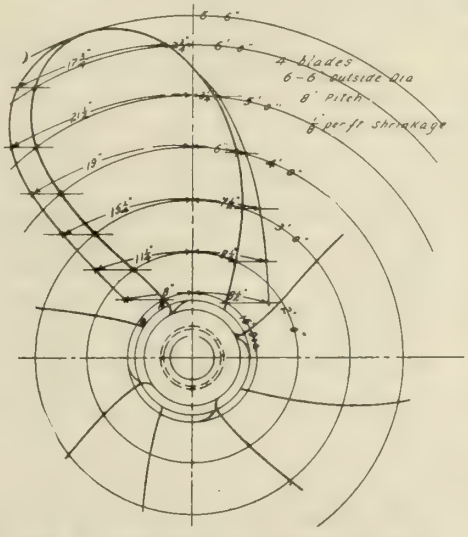


FIG. 8—POSITION OF BLADES AT HUB.

If the blades where they touch the hub as at A and B had been much closer together we could hardly have got a straight lift. We might have had to worm it out.

Before the supports were all fastened we fitted templates to the run of the pattern for making the bars in cope box. See Fig. 6.

To locate the cope we put 2 plates in, having match board pins, these being located from holes previously drilled in the drag box.

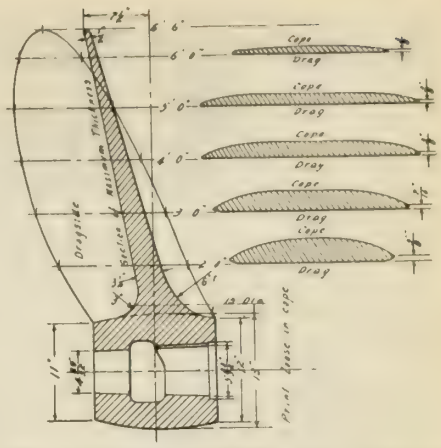


FIG. 9—SHOWS THICKNESS AND SHAPE AT DIFFERENT PARTS OF BLADE.

For lifting purposes, we bored 4 1⅛ in. holes through the outer ring, halfway down and equally spaced.

Molding Box

18. We made a segment and sticks for the drag and a segment and sticks for the cope.

We made these segments 38 in. long and tapered them a little on the length so they would draw round easier.

19. As stated on the preceding page, we fitted templates against the blades to get the shape for the cope bars, after, of course, having marked off on the follow board where each bar would come.

We then made a quarter pattern as shown in Fig. 7. The 16-in. square hole was printed and cored, the print being fixed with an 1 15-16 in. hole, with the cap part to screw on. We figured on the bars being from ¾ to 1 in. clear of the pattern.

To make sure that the shape of bars was right, they rammed up a drag, rolled it over, took away the follow board and tried the quarter pattern in place. Then we chalked the position of the pattern on the drag, so they could place the cope box on without difficulty.

Theodore Roosevelt said of trade unionism:

"The union must accept the responsibility that comes with power. It must recognize its obligation to the industry and to the community as a whole. It must be judged by its conduct precisely as a corporation is judged by its conduct. It must do its utmost to promote the efficiency of its members, for unless the business is increasingly productive there will be no sufficient reward for anybody, no profit to the shareholders, no adequate wage for the working man, no proper service to the public."

Fire and water-proof cement for covering. Equal parts of gum-arabac, plaster of paris, and iron filings. Keep in a dry place, and mix with water when wanted.

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

BEFORE going further into the study of the theory of heat, a few words on the means of measuring sensible heat, or temperature, are necessary. The themometer is merely a glass tube, placed on a graduated scale, with a bulb blown on the bottom of the tube to form a reservoir. This reservoir contains a volatile liquid, usually mercury, the rate of expansion of which is known. There are three scales in use, the most commonly used of which is the Fahrenheit scale. This scale has a zero mark, which is 32 degrees below the freezing point, and the boiling point, which is 212 degrees, or 180 degrees above the freezing point.

The Centigrade scale is the one in use for scientific purposes, and also in some countries for general engineering purposes. The zero point for this scale is also the freezing point, and the boiling point is at 100 degrees.

The third scale is called the Reaumur, and is, the zero and freezing point of which are the same, but the boiling point is at 80 degrees. This last scale is practically obsolete as far as any engineering purposes are concerned.

It is well that the student should know how to convert a reading on one scale to the equivalent reading on either of the others, and a little thought will show how this can be attained. The number of degrees between the freezing and boiling point on each of the three scales bear a definite relation to the others. For instance, the number of degrees on the Fahrenheit scale between these two points is $212 - 32 = 180$. On the Centigrade scale it is $100 - 0 = 100$, and on the Reaumur scale it is $80 - 0 = 80$. We have, then, 80:100:180 or 4:5:9. For instance, the number of degrees on the Centigrade scale between freezing and boiling points is $\frac{100}{180}$ of those on the Fahrenheit scale. $\frac{100}{180}$ in its lowest dimension is $\frac{5}{9}$. If we have a reading on the Centigrade scale of 40 the corresponding reading on the Fahrenheit scale would be found as follows: Let t = Fahr., and t_1 = Cent. Then $t = \frac{9}{5} t_1 + 32$.

Substituting figures, we get $t = (1.8 \times 40) + 32$, so the Fahrenheit reading will be 104 degrees. Conversely, 104 degrees Fahrenheit can be converted to Centigrade by reversing the formula. In this case the reading will be $\frac{5}{9}$ of the Fahrenheit, and the 32 degrees on the Fahrenheit scale must be subtracted from the Fahrenheit temperature before multiplying. Thus $t_1 = \frac{5}{9} (t - 32) = .55$ $(104 - 32) = .55 \times 72$, which gives 39.6 Centigrade. The difference can be accounted for by carrying the recurring decimal further, as for instance:

$$.5555(104 - 32) = 39.996.$$

The conversion from the Reaumur to Fahrenheit is made in the same way, though the proportion in this case is 80 : 180 instead of 100 : 180. The expression would thus be, if the Reaumur reading was 40, and using t for Fahrenheit, and t_1 for Reaumur:

$$t = (t_1 \frac{9}{4}) + 32$$

$$(40 \times \frac{9}{4}) + 32$$

$$= 122 \text{ Fahrenheit.}$$

Conversely, $t_1 = \frac{4}{9} (t - 32)$

$$= \frac{4}{9} (122 - 32)$$

$$= \frac{4}{9} \times 90$$

$$= 40$$

Converting Centigrade to Reaumur is exactly the same excepting that the addition or subtraction of 32 is not necessary.

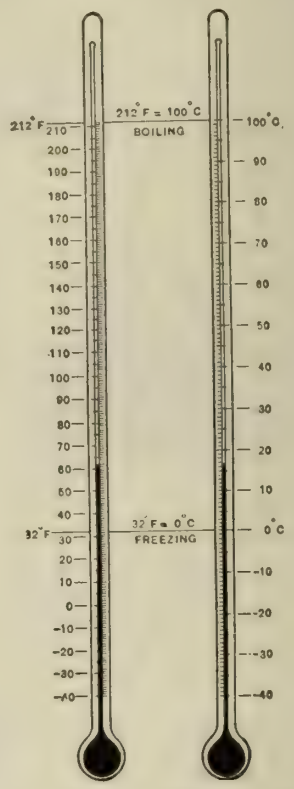
For instance, if Reaumur reads 60, then Centigrade will be $60 \times \frac{5}{4} = 75$, while the converse would be C = 75, then R will be $75 \times \frac{4}{5} = 60$.

The conversion from Centigrade to Fahrenheit and vice versa will be the one most often used. It is easy to remember, as $C. = \frac{5}{9} F.$ and $F. = \frac{9}{5} C.$ The addition or subtraction of the 32 must be watched carefully. When converting from Centigrade to Fahrenheit add the 32 to the product of $\frac{9}{5}$ C., but when converting to C. from F., subtract the 32 from F. before making the multiplication. The formula is easy to remember:

$$\text{Degrees C.} = \frac{5}{9} (\text{F.} - 32)$$

$$\text{Degrees F.} = \frac{9}{5} \text{ C.} + 32.$$

The reason for the addition or subtraction of 32 when making conversions into or from Fahrenheit is simple. The ratio of Centigrade or Reaumur to Fahrenheit is calculated from freezing to boiling point, and while this includes zero on the first two, the freezing point on Fahrenheit is 32 degrees above zero. Hence the correction.



The ordinary mercury thermometer is not capable of measuring temperatures above 350 degrees to 400 degrees. When higher temperatures are to be taken by means of a thermometer, such as a chimney or economizer gases, a modification of the ordinary instrument must be used. This special instrument is made with a seal of nitrogen gas on top of the mercury column. The effect this has is to create a pressure when the mercury expands, and this increased pressure raises the boiling point of the mercury, which at atmospheric pressure is 662 degrees. Another means of measuring high temperatures is by means of the pyrometer. This is an instrument which utilizes the property of different

metals to set up a difference of electric potential, when connected together through a galvanometer and exposed to the heat. This instrument is used to take furnace temperatures, etc.

Having now seen that sensible heat can be measured by means of suitable instruments, and that heat, both sensible and latent, has a definite unit, the British thermal unit, corresponding to 778 foot pounds, we can go on to consider the different ways in which heat is transferred from one body to another.

Transference of Heat

There are three ways in which heat is conveyed from a hot body to one of lower temperature. These are by radiation, conduction, and convection, and these will be studied in detail.

Radiation is the means which is most often observed by the average person. It is the means by which we get the heat of the sun on to the earth. Rays of heat are always thrown out from a hot body, and will enter a cold body, or heat the air in its immediate proximity. It is the property of heat to radiate from a hot body which is taken advantage of in the use of heating coils in a building. It is also the property that causes the engineer immense loss if not guarded against, in places where it is not wanted. That is why boilers must be lagged, steam pipes and steam cylinders covered, and feed-water heaters protected with heat insulating or non-conducting compositions. Radiation losses are very serious and cannot be too carefully watched. For instance, the average loss per square foot of bare pipe per hour per degree difference of temperature, with steam at 100 lbs. gauge, is 2.75 B.t.u. Suppose we have a 4-inch steam pipe, the outside diameter of which is 4½ inches. The circumference of this pipe will be $4.5 \times 3.1416 = 14.137$ inches. A length of pipe 10 inches long will contain a square foot of surface. If the temperature of the steam is 338 degrees and the air 60 degrees, the difference is 278 degrees. The total B.t.u. lost per hour on this one square foot of pipe is 746. It would only take about seventeen square feet of this bare pipe to radiate as many heat units as are contained in a ton of coal. Does this make you realize the importance of radiation? However, this property of radiation is also useful as we have already seen in heating buildings. It is also seen in boiler furnaces, where the heat from the fire radiates on to the shell of the boiler, or the plates of the furnace. The firebrick lining of the furnace absorbs heat to a certain point and then radiates or reflects the heat rays striking it. When the fire is burned down and gone out this hot lining radiates the heat it has absorbed during the time the fire has been going.

Conduction

We have said that the fire radiates its heat on to the plates of the boiler. How, then, does the heat reach the water contained therein. Obviously it must pass through the plates, and this process is known as conduction. The plate immediately in contact with the flame or hot gas from the fire becomes warm, and immediately begins to communicate the warmth to the molecules or layer of metal immediately in touch with it. This process goes on through the thickness of the plate till the heat applied at one side is conducted through to the other. Now various metals have different degrees of heat conductivity as they have of electrical conductivity. For instance, copper is a good conductor of electricity. That is, a current can be sent along a copper wire more easily than along an iron wire. Heat is conducted more quickly through copper than through iron or steel. Asbestos is almost a non-conductor. A dead air space is the poorest conductor, or the best insulator known. Following is a list of various metals, with their conducting powers. These are expressed in units of heat conducted through a plate of the material one inch thick, for one square foot surface per hour, the difference in temperature being 1 deg. on the different sides of the plate:

	B.t.u.
Copper	515
Iron	233
Lead	113
Stone	16.7
Glass	6.6
Brick	4.8

Convection

There remains the third method of heat transference, namely, convection. The heat has been radiated from the fire on to the plates, and has passed through the plates by conduction. If it is not taken away by some means the plate will go on absorbing heat until the point is reached where it will melt, or become fluid enough to be distorted. This is what happens when boiler furnaces are bulged, or collapse. However, if the plate is in contact with the water the water will absorb the heat. This will result in the water immediately in contact with the plate becoming lighter than the overlaying water. It will therefore rise, and its place will be taken by cooler water. The warm water, rising, will convey the heat to the water surrounding it, and thus a circulation or convection of heat by means of streams of warm water will be commenced. This will continue until the fire is allowed to die out It is on the rapidity and diffusion of these streams of water that the effectiveness of a boiler greatly depends, and the design of boilers has been influenced by attempts to get the best circulation. It was on this factor that the inception of the water tube boiler depended. It is poor circulation which is the only real disadvantage of the Scotch type of boiler.

FIVE NEW BRITISH SHIPS A WEEK

During the war the total output of ships of all kinds from the shipbuilding yards of the Tyne, Wear, and Tees, amounted to 1,130 ships, with a total tonnage of nearly 3,330,000. Taking the duration of the war as 221 weeks, this means an average of five ships a week. This production is all the more remarkable as the labor market was depleted by the urgent call for recruits, and as many of the vessels constructed were of a novel type. The ships included battleships, cruisers, submarines, steam and oil launches, train ferries, ice breakers, power barges, tank steamers, cargo and passenger ships, cereal ships, destroyers, minesweepers, trawlers, troop ships, cable steamers, monitors, lighters, standard ships, and the mysterious "Q" boats.

BRITISH SCIENCE AND ENGINEERING

Professor J. C. McLennan, scientific adviser to the British Admiralty, recently read a paper before the North-East Coast Institution of Engineers and Shipbuilders on the application of science to marine problems. Incidentally the paper reveals the high standard which British scientific engineering reached in dealing with the special difficulties which had to be met during the past few years. Conspicuous among the devices developed originally for anti-submarine purposes but certain to be invaluable to shipping under peace conditions is the hydrophone—an instrument which detects underwater vibrations set up by a moving vessel. Microphones and magnetophones of exceedingly high sensitiveness were employed, sometimes with attachments which enabled the listener to ascertain the direction from which the disturbance was coming. The "silent submarine" was, however, introduced to circumvent the hydrophone, and this development was countered by the "echo method" under which a beam of sound was sent out by chasing the vessel, sweeping the seas like a searchlight, and causing an echo when it strikes a solid object such as a submarine. Even more ingenious is the "leader gear," invented by the British for another purpose. If a cable laid on the bottom of the sea—say in the channel leading into a harbor—is traversed by alternating current, it is possible, by means of delicate devices installed on board ship, for the navigator to see or hear indications of the presence of such a cable. So perfect is the mechanism that a ship can proceed at 20 knots in fogs or darkness, feeling its way along the cable almost as precisely as a tramcar trolley follows the overhead wire. Professor McLennan states that "by leader gear law in such areas as the River St. Lawrence, the entrance to the Thames, or Halifax Harbor, the Straits of Dover, etc., in and out lanes of traffic can be maintained with ease in fogs." The echo method can also be used for sounding, for locating icebergs, surface vessels, and rock-bound coasts in a fog. In fact "under peace conditions many important technical systems and devices brought forward during the war will find immediate application as aids to navigation."

There is only one way—and it is a sure way—to reduce the cost of living—an expression which means to get more of the necessaries of life by work. It is to produce more, not less.



SECTION THROUGH BUILDING.

Cunard Line's New Offices in New York

The building wreckers are now removing the last traces of the old Stevens House and some eighteenth century buildings on the adjoining Morris street from the plot bounded by Broadway, Morris and Greenwich streets, on which is to be erected the Cunard Building, a twenty-one storey office building to house the New York offices of the Cunard Steamship Company, Limited, the Anchor Line, the Anchor-Donaldson Line, and other allied and subsidiary lines of the Cunard Company. Not only is this the largest project in New York City since the cessation of building brought about by the war, but it is also the largest building proposition and realty operation ever undertaken in this country, or in the world at large, by a shipping firm.

The Cunard Building will be twenty-one stories in height from the Broadway curb, with rentable floor space varying on the different floors from 25,000 to 30,000 square feet, each with a total floor area of more than 700,000 square feet. Of this, the Cunard Line reserve for their own use the basement and the first three floors, leaving more than 500,000 square feet available for renting purposes.

More than two years have been spent in the study of the problem and in the preparation of the plans and the building will embody the best possible practice and experience in every detail relating to modern office building of the best type. Advantage has been taken of every recent improvement tending either to increase the comfort of the tenant or expedite his business. As a characteristic detail it may be mentioned that there will be twenty-eight high speed, passenger elevators. The freight elevators are totally distinct from the passenger service with separate approach. The entrance halls will not be covered up with newsstands, cigar booths, bootblacks, and other miscellaneous minor business adventures, which have been tolerated in many of the bigger New York buildings. The building's architectural style expresses in plan and construction the present day, the general type being an adaptation of the Italian Renaissance.

Perhaps the most striking feature about the new building to the public will be the great hall provided for the passenger department of the Cunard and its allied and subsidiary lines, two architectural views of which are given herewith. This room is the largest of its kind in this country, and probably in the world, devoted to steamship traffic. It compares rather with a large auditorium or with the terminal waiting rooms of our railway systems than with the average steamship ticket office as it now exists. The floor plans show that the great hall has a length of 185 feet, a width of 74 feet, and a height of 65 feet. These figures may perhaps mean more when it is realized that they represent a height greater than the average six storey dwelling, three times the width and nearly double the length. In other words, the future Cunard passenger, after May 1, 1921, may make his arrangements in a hall the size of a six-storey building covering nearly six city lots. This will occupy the major space of the grade floor and the first three floors.

The location to be covered by the Cunard Building is of peculiar historical interest. Across Morris street, a few feet to the north, were erected the first white habitations on Manhattan Island, when Capt. Adrian Block built four huts to house the crew of the Tiger during the interval between the burning of that ship and the building of the Restless. With the buildings adjacent to the south, the Bowling Green Building and the Washington Building, the Cunard Building occupies the site of the first Dutch city of New Amsterdam. At No. 1 Broadway, under the Washington Building, is the site of Kocks Tavern, British headquarters during the Revolution. Where the Bowling Green Building now stands at No. 9 Broadway, was, for many years, the well-known Atlantic Garden. Bowling Green, upon which the Cunard Building faces, was for two centuries the social centre of New Amsterdam and of New York. It still retains in part the hand-wrought, soft, iron railing, put up over a century ago. At No. 3 Morris street, in a dingy worn house, which has for several years been a boarding house for Bulgarian emigrants, once lived Aaron Burr, when that gentleman was water commissioner of the City of New York. The Stevens House on the Broadway and Morris street corner was for a



ENTRANCE HALL

long period, especially during the decade immediately preceding the Civil War, the fashionable hotel of the city. Its register during that period reads like a combined Whos Who and Social Directory. It has existed in its present form since 1846, when it was remodelled by the orginal Charles Delmonico and for many years housed his restaurant.

To the person interested in the sentimental and historic aspects of New York City there is something peculiarly fitting in the rescue of this piece of land from the base uses to which it has descended in the last generation and in the erection thereupon of a building which will not only be a model sky-scraper but which will have a historic interest of its own as the largest building ever erected by a steamship company, the first to be built in this country by a British steamship corporation. It stands as a visible monument of trans-Atlantic good will.

CANADIAN MERCHANT FLEET MOVEMENTS

Winter Schedule Arranged

Following is the fall and winter schedule of sailings arranged by the C.G.M.M., from Montreal and the Atlantic ports:

Liverpool Service

From Montreal

		Tons	1919
Canadian	Miller	8100	Sept. 25
Canadian	Ranger	8100	Sept. 28
Canadian	Seigneur	8100	Oct. 10
Canadian	Navigator	4300	Oct. 20
Canadian	Trooper	4300	Oct. 25
Canadian	Miller	8100	Nov. 12
Canadian	Ranger	8100	Nov. 15
Canadian	Spinner	8100	Nov. 24

From Halifax, N.S.

		Tons	1919
Canadian	Seigneur	8100	Nov. 28
Canadian	Rancher	5100	Dec. 4
Canadian	Miller	8100	Dec. 29
			1920
Canadian	Ranger	8100	Jan. 2
Canadian	Spinner	8100	Jan. 10
Canadian	Seigneur	8100	Jan. 15
Canadian	Rancher	5100	Jan. 22

From St. John, N.B.

		Tons	1919
Canadian	Hunter	5100	Dec. 5
Canadian	Trooper	5300	Dec. 10
			1920
Canadian	Hunter	5100	Jan. 20
Canadian	Trooper	4300	Dec. 10

London Service

From Montreal

		Tons	1919
Canadian	Voyageur	4300	Nov. 15
Canadian	Volunteer	4300	Nov. 21

From Halifax, N.S.

		Tons	1919
Canadian	Voyageur	4300	Dec. 31
		Tons	1920
Canadian	Volunteer	4300	Jan. 5
Canadian	Voyageur	4300	Feb. 15

Glasgow Service

From Halifax

			1919
Canadian	Trooper	5100	Nov. 28
Canadian	Navigator	4300	Dec. 5
Canadian	Aviator	5100	Dec. 30
		Tons	1919
Canadian	Trapper	5100	Jan. 12
Canadian	Aviator	5100	Feb. 14

Avonmouth Service

From St. John

		Tons	1920
Canadian	Beaver	3750	Jan. 7
Canadian	Navigator	4300	Jan. 15
Canadian	Beaver	3750	Feb. 22

Buenos Aires Service

From Montreal

		Tons	1919
Canadian	Settler	5100	Oct. 15
Canadian	Planter	8100	Nov. 25

From Halifax

		Tons	
Canadian	Pioneer	8100	Dec. 15
			1920
Canadian	Settler	5100	Jan. 15
Canadian	Planter	8100	Feb. 15

Australian Service

From Vancouver

		Tons	1919 About
Canadian	Raider	5100	Nov. 15

St. John's, Nfd., Service

From Montreal

		Tons	1919
Canadian	Volunteer	3400	Sept. 30
Canadian	Adventurer	3400	Oct. 15
Canadian	Adventurer	3400	Oct. 29
Canadian	Sower	3400	Nov. 1
Canadian	Adventurer	3400	Nov. 12
Canadian	Sower	3400	Nov. 15
Canadian	Adventurer	3400	Nov. 26

Havana, Cuba, Service

From Montreal

		Tons	1919
Canadian	Sailor	3400	Oct. 7

From Halifax

		Tons	
Canadian	Volunteer	3400	Oct. 7
Canadian	Trader	3400	Oct. 26
Canadian	Sailor	3400	Nov. 9
Canadian	Trader	3400	Nov. 23
Canadian	Trader	3400	Nov. 23
Canadian	Sailor	3400	Dec. 7
Canadian	Trader	3400	Dec. 21

Barbadoes, Trinidad and Kingston Service

From Montreal

		Tons	1919
Canadian	Recruit	3750	Jan. 27

Barbadoes, Trinidad and Demerera Service

From Montreal

		Tons	1919
Canadian	Signaller	3750	Oct. 25
Canadian	Gunner	3750	Nov. 12

From Halifax

		Tons	
Canadian	Signaller	3750	Dec. 12
		Tons	1920
Canadian	Gunner	3750	Jan. 10
Canadian	Signaller	3750	Jan. 29
Canadian	Gunner	3750	Feb. 16

Kingston, Jamaica and Havana, Cuba, Service

From Montreal

		Tons	1919
Canadian	Warrior	3750	Oct. 29
Canadian	Recruit	3750	Nov. 18

From St. John

		Tons	
Canadian	Warrior	3750	Dec. 8
Canadian	Recruit	3750	Dec. 28
		Tons	1920
Canadian	Warrior	3750	Jan. 12
Canadian	Recruits	3750	Jan. 27

MARINE BOILER LOGIC

The Heine Safety Boiler Co., St. Louis, Mo., has just completed the printing of "Marine Boiler Logic," a 69-page booklet dealing with the fundamental design of marine cargo carriers. The booklet was written by Chas. H. Stoddard, consulting marine engineer of the Heine Company.

The main part of the booklet relates to the design and construction of Scotch and water tube boilers for marine purposes. Evaporative capacities are worked out for the two types, using coal or oil as fuel, with natural or forced draft. The booklet contains also a discussion of power and speed of cargo vessels, formulas being developed showing the relation between boiler and prime mover capacity, and the dimensions of the hull. In making these computations, the method developed by Rear Admiral D. W. Taylor of the United States Navy has been used, with certain modifications suggested by Mr. Stoddard's experience.

The last part of the booklet is devoted to a description of the construction and operation of the cross-drum type of water tube boiler developed by the Heine Company for marine service.

Liverpool, N.S.—The Nova Scotia Shipbuilding & Transportation Co., Ltd., of Liverpool, N.S., have recently launched a beam trawler of 600 tons. The vessel, which was called the "David," was built for owners at Le Havre, and is of 168 feet length, by 26 feet beam and is 13 feet depth. She has an unlimited trans-Atlantic class. The company have two vessels on the stocks, which will be launched some time this month, and two more vessels will be laid down on the vacant ways.

Newcastle, N.B.—The Miramichi Construction Company recently launched at Newcastle, N.B., a 600-ton four-masted schooner. As this was the first time in many years that a vessel this size had been launched on the Miramichi, it caused considerable local interest, and a large crowd was on hand to witness the launch. The vessel is considered one of the best built vessels in the province. She will be completed and ready for sea about the end of September.

Eastern and Western Canada Marine Activities

September Correspondence

MONTREAL AND MARITIME

DURING the past six weeks or so the steamship arrivals and sailings to and from the port of Montreal have been quite irregular, largely owing to dock troubles in British ports, which condition has materially interfered with the loading and departure of vessels from those ports. This was so serious at times that many trans-Atlantic steamers coaled up on this side for the round trip. This condition has been somewhat relieved of late, but its effect is still evident. Work is progressing on the new developments in connection with the extensions in and about the harbor. Considerable work has been done on Commissioners street, where the tracks of the Tramways Co. are being taken up and transferred to the north side of the street, to make room for the additional track space that will be required by the Harbor Commission.

Clarence I. de Sola, the Belgian consul in Montreal, has been honored with the Belgian knighthood by King Albert, being created Chevalier of the Order of Leopold in recognition of his valuable services to Belgium during the war. This title is the highest in the power of the Belgian monarch to bestow. Mr. de Sola was actively engaged in shipbuilding during the war.

The Montreal Harbor Commissioners have delayed the enforcement of the new wharf rates that were contemplated some time ago. The date now fixed is that of January 1, 1920, as this will give the different commission agents and shippers ample time to state their individual cases against the proposed rates of increase. Shipping during the remainder of this season, therefore, will not be affected by the action of the Harbor Commissioners.

The United States training ship "Newport" was in Montreal port for a few days late in August and created considerable interest along the waterfront. She is a sailing vessel, barquentine rigged, and equipped with steam auxiliary, carries a crew of 80 cadets, 6 officers, captain and navigating crew. She sailed on the 28th for Bermuda. It is interesting to note that the captain and entire staff are all graduates of this training ship.

From a statement recently made by an official of the C.P.O.S., there is every reason to believe that there is plenty of cargo space available for the export of Canadian products. As a mater of fact, many shipping firms are looking for cargoes, and it would appear that the cry of some exporters of the lack of shipping space, due to the requirements of the Ministry of Shipping, is not warranted.

During a severe gale along the coast about the middle of the month, the steamer "Yukon" broke away from her anchorage and drove ashore at a part of Clam Harbor known as Long Island, and was wrecked in a very short time. Capt. Hicks and the crew stuck to the vessel for a couple of days, but with the increasing danger decided to leave before the vessel finally broke her anchorage. The following day she was driven ashore and became a total loss. She was laden with herrings consigned to A. J. Birks, of Halifax.

Some significance of Canada's trade possibilities may be gathered in the recent shipment of coal from Sydney, N.S., when an order from Norway was filled and delivered amounting to 10,000 tons. While the initial shipment is more in the form of an experiment to test the economic value of coal trade with this country, there is the possibility that this may become a general trade development. Before the war no coal was shipped to Norway from this country, as it could be sent there from England much cheaper than from here.

The visit to the port of Montreal of the C.P.O.S. Sardinian recalls some interesting points of Canadian history that are not generally known. It was this vessel, in the fall of 1878, that brought the Marquis of Lorne over to act as Canada's Governor-General. This, however, was by no means her maiden voyage, and few vessels can show such a record for long service. The Sardinian is the oldest vessel trading at the port of Montreal, as she has long been relegated to the freight service, but is still able to do her bit with the best of them.

The importance of Montreal as an ocean terminal was recently exemplified in the loading of the S. S. Alston with a general cargo. This accomplishment is very interesting, as it is a record for the port in the loading of an ocean vessel. This vessel, operated by the McLean-Kennedy Co., was completely loaded with a general cargo of 7,000 tons, in 2½ days. It is generally conceded that the port of Montreal clears vessels two days quicker than either New York or Philadelphia, but this recent loading is an outstanding achievement for quick loading.

Coupled with the dockyard strikes that have prevailed during the season in different British ports, the extreme foggy weather along the coast has been instrumental in delaying the regular arrivals of passenger and mail steamers, and for this reason the Canadian and British Governments have been utilizing some of the faster freighters for the carrying of mail. In some instances as long as 50 hours have been spent outside of the river mouth awaiting the clearing of the weather, and as the time of a fast cargo boat is generally 9 days, they have been used quite freely for the transmission of mails.

An illustration of the possibilities of marine regeneration may be had in the history of the steamer "Sabara," which was in the port of Montreal about the first of the month, taking on a cargo of flour. This was originally a German vessel registered by the name of "Monte Penedo" and belonging to the Hamburg-Sudamericanische Dampfschiffahrts-Gesellschaft (Hamburg-South American Steamship Co.). On the entry of Brazil into the war, this vessel was interned and subsequently manned by a Brazilian crew, who are still with her. She has been chartered by the French Government, and is being operated by the Cosmopolitan Shipping Co. of New York. Robert Reford Co. are the local agents.

The Fraser Brace Shipyards are just completing the eight vessels they were building for the French Government. Some little delay has been experienced owing to the deferred delivery of the boilers, but these are now all on hand and good progress is being made with the final fitting of the vessels. Some of these have already been given their trial ships and it is expected that within the next month the entire eight will have been delivered to the owners. Owing to the permanent nature of the shipbuilding industry the Fraser Brace Co. have decided to convert the basin in which they have built these vessels into a suitable dry dock for the repairs and building of lake vessels. It is likewise possible that a plant will be erected on this site for the construction of steel steamships for lake service; negotiations are now on for work of this character.

Announcement has been made that the plans and specifications for the new drydock for Louisburg harbor have recently been completed and that they are now before the Federal Government for approval. When this has been given it is anticipated that work will be commenced at the earliest possible moment. It is expected that about 800 men will be required in the construction of the work. English capital is largely interested in the development. It is thought that this enterprise will be operated in conjunction with the development of iron ore and coal properties of Cape Breton. The samples of ore in this district are greatly superior to any that are discovered in Canada, and it is much better than that imported from the Lake Superior ores that are used by the steel company in the district.

An advance of 75 cents per foot draught has become effective this month on the pilotage rates in the Montreal district. The new rates will be $3.75 per foot draught for coasting vessels and $4.00 per foot draught for all ocean-going vessels. This has been decided after considerable investigation on the part of G. E. E. Robertson, gen-

eral superintendent of pilotage service in Canada, and on his recommendation the new rates have met the approval of the Minister of Marine. There is at the present time, a proposal before the Minister of Marine and Fisheries to discontinue the compulsory payment of pilotage, both in the Montreal and the Quebec districts. It is explained that, owing to the improvement made in the River channel, that the necessity for compulsory pilotage has largely disappeared.

Late last month the S. S. Faraday, the largest cable-laying vessel in the world, came to the port of Montreal, where she was loaded with a cargo of barley for overseas. Owing to the weather getting too rough for her usual duties, she has been acquired to assist in the carrying of freight to Europe. The Faraday is over 40 years old and has laid practically every long distance cable in the world, both in the Pacific and the Atlantic. She is constructed on peculiar lines, which never seem to have been duplicated, her two funnels being abreast of each other. This vessel was extensively used during the war; she put down a 1,800 mile cable between Ireland and Newfoundland, and during the work was escorted by a cruiser and a dozen patrol boats. She laid the entire length of cable without a single hitch.

Reports from local shipping offices indicate that passenger traffic from the port of Montreal to European ports will be of the capacity character for the remainder of the season, particularly regarding the cabin accommodation. Unsettled conditions in many of the European countries prevent heavy third-class bookings. Considerable difficulty is experienced in obtaining passage on west-bound vessels, and it is stated that premiums are frequently offered for passage to Canada or the United States. In the opinion of the shipping authorities here, this condition will prevail nearly all winter, owing to the great numbers that are anxious to return to this continent. Many aliens here, seeking passports, are unable to obtain them, as in many instances formal ratification of the peace treaty is necessary before they can be issued.

A return to pre-war activities on the Lachine Canal is shown in the report for the month of August, this period being one of the busiest since the beginning of the war. The movement of grain, although below that of pre-war years, shows a large increase over that of last year, the actual figures showing an increase of 2,550,850 bushels, the amount carried during the past month being 3,731,420 bushels. Wheat predominated in grain traffic, the figures being over 1,300,000 bushels. Other grains showed substantial increases. For the present season, to date, the movement of grain has been close to 15,000,000 bushels. Flour and farm produce showed a decline, the figures on the former being nil. Coal traffic for August decreased this year over 50 per cent. of that for the same month last year. In general, the vessel movement for the month has been considerably less this year than last.

Following the policy of the British Government in disarming merchant vessels, the Department of Naval Service has issued instructions that ships of Canadian register, which had guns mounted during the war, shall have the same removed. Respecting the ship fittings incidental to the mounting of the guns, the following order has been issued. "On removing the guns the gun seating is to remain in ships over 3,000 gross register and stiffening to remain in all cases except in vessels under 1,600 tons, where, in the opinion of the naval authorities, it materially affects cargo or passenger accommodation. The stiffening for the howitzers may also be removed in all ships if it interferes with cargo or passenger accommodation." It may be gathered from the wording of these instructions that Britain, while calling for disarmament, is nevertheless determined to guard against future operations of enemy submarines.

A recent statement by R. B. Teakle, manager of the Canadian Government Merchant Marine, indicates that by the middle of next summer there will be 47 cargo vessels in the service. Eleven of these are now in commission, and with the various yards in Canada turning out an aggregate of about four a month, the remaining 36 will be ready next year. The range of tonnage will be from 2,800 to 10,000 tons per vessel, the majority being of 8,000 tons deadweight capacity. It is understood that the vessels of the C.G.M.M. will use the ports of St. John and Halifax as terminals during the winter months, and it is believed that sufficient freight will be available to keep both ports busy in addition to the business furnished by other lines. Shippers will be duly advised of the winter sailings of the Government vessels. I. J. Tait has been appointed superintendent engineer in charge of the C.G.M.M. fleet, with headquarters at 260 St. James St., Montreal. Mr. Tait was formerly chief engineer of the Royal George, and for the past six years has been associated with J. T. Farmer as a consulting engineer in Montreal.

BRITISH COLUMBIA

COAST shipbuilders are anxiously awaiting news of the placing of new steel ship contracts. While there have been no developments of a definite nature in this connection, several reports have been in circulation and general impression is that an announcement giving details of a new programme that will renew steel shipbuilding activity on a large scale will shortly be made.

It was stated not long ago that the Coughlan and Wallace yards in Vancouver had been offered contracts for twelve steel ships at an aggregate price in the neighborhood of $15,000,000. New York interests were said to be involved, and it was mentioned that the vessels under consideration would be colliers.

French and Italian interests are showing interest in Pacific Coast yards and reports from Seattle indicate that they are shortly to place orders in that city. Japan is making an effort to secure new contracts, as well, so that the Canadian yards will have competition in attempting to find business.

The Royal Commission that has been investigating general conditions in the Coughlan steel shipbuilding plant made a strong plea in its closing report for the award of additional contracts with a view to staying labor unrest. The report says in part: "The men feel that the Dominion Government should take care of the situation at least for a time, even if shipbuilding in the West entails a somewhat higher cost than in the East. The alternative is the expenditure of money to support the idle worker, with all the attendant unrest and agitation which would almost inevitably follow."

The wooden shipbuilding situation is similarly indefinite. The Foundation Company at Victoria has now launched all but three of the twenty vessels contracted for by the French Government, and the last hull will be off the ways by October 10. While the outfitting of the vessels will not be complete until the end of the year, the contract is nearing completion and unless new business is found there will be unemployment on a large scale. The company has been endeavoring to secure new orders for several months, but so far has been unsuccessful. The termination of the war has unquestionably slowed up the market for wooden tonnage.

Increases amounting to approximately 25 per cent. in trans-Pacific passenger rates have been announced by the Nippon Yusen Kaisha, effective as from September 28. Inauguration of a new passenger steamship service round the world is said to be the ambition of the famous Japanese shipping concern. It is said to be its intention to place additional steamships on the Pacific and on the Atlantic, with train connections across this continent. Assistance from the Japanese Government is sought to finance the project in its early stages.

Providing a uniform scale for British Columbia, Washington and Oregon ports for the first time in Northwest history and granting increases up to fifteen cents an hour on straight time work and thirty cents an hour on overtime work, a new agreement has been signed by representatives of the Northwest Waterfront Employers' Union and the Pacific Coast District Council of the International Longshoremen's Association. Under the new scale the rate is as follows: Longshoremen on coastwise and deep-sea work, 90 cents an hour, straight time, and $1.35 an hour overtime. Truckers receive 80 cents an hour straight time and $1.20 overtime. Lumber handlers get 95 cents an hour straight time and $1.40 overtime.

After being identified with shipbuild-

ing and ship repair work in Victoria for thirty-nine years, Mr. Samuel McCully Smith died suddenly a few days ago, at the age of 77 years. Mr. Smith was one of the real old-timers among Pacific Coast shipbuilders.

Erection of a fitting-out plant and marine machinery industry to cost approximately $1,000,000, which will employ 1,500 to 2,000 men, is said to be assured by the sale of a large area of waterfrontage on Burrard Inlet, Vancouver, near the Government docks and elevator.

The Shimbu Maru, a Japanese freighter of 4,000 tons, ran aground near Bentinck Island, twenty miles from Victoria, recently, during a dense fog. The Pacific Salvage Company steamer Algerine rescued the vessel when the crew was preparing to abandon her, and towed her to shallow water, the pumps working desperately all the time. The ship will be repaired at Seattle.

The owners and crew of the fishing boat Iskum will get $1,000 and costs in their case against the C.P.R. as salvage money in connection with the taking of passengers and mail from the steamer Princess Adelaide, when she grounded in Active Pass.

Letters to the Editor

To Editor of MARINE ENGINEER.

Dear Sir.—How far would a ship travel after the telegraph had rung from full speed ahead to full speed astern before she went astern? Take the City of Paris for an example, 10,000 tons, 21,000 h.p., 21 knots. Fine weather.

—C. A.

This is a question which comes up occasionally, and is really a matter of applied mechanics. As is too often the case with these enquiries, the data given is of the vaguest. We have not the particulars of the City of Paris at hand, but we can take a ship of approximately similar dimensions for the purposes of the question.

The resistance to the passage of a ship through the water depends on her displacement and form. The chief factor, however, is the skin resistance, the other factors being due to wave making and eddy making, called residual resistance, and the action of the propeller on the hull, known as augmented resistance. In a fast ship of, say, 20 to 25 knots, the frictional resistance amounts to about 80 per cent. of the whole. The amount of wetted surface in a ship such as we are considering may be taken as 40,000 sq. feet, and the resistance in pounds as 500 lbs. per 100 sq. ft. of wetted skin. That would make the total resistance to motion

$$\frac{40{,}000\times500}{100}$$

and if this is allowed to be 80 per cent. of the whole amount the total resistance will be

$$\frac{40{,}000\times500\times100}{100\times80} = 250{,}000 \text{ lbs.}$$

Now, the horse power is given in the question as 20,000. This is I.H.P. or indicated horse power, and if we take the net horse power delivered at the propeller at 40 per cent. of this it gives 8,000 E.H.P. or effective horse power.

Now, we know that to every action there is an equal and opposite reaction, and if we have a resistance of 250,000 lbs. we must have a force of that amount to overcome it. How does our 8,000 h.p. compare with the 250,000 lbs. resistance. 8,000 h.p. is 8,000×33,000 ft. lbs., and if we presume the piston speed to be 900 feet per minute we get

$$\frac{8{,}000\times33{,}000}{900} = 293{,}333.3 \text{ lbs.}$$

That is not bad for an approximation. Now, the amount of energy in a moving body is proportional to its weight and velocity, so the kinetic energy is

$\frac{Wv^2}{2g}$ where W = weight in lbs.
v = speed in feet per sec.
g = 32.2

The change in kinetic energy through a change in velocity is equal to the force exerted × the distance. Now the proposition is to determine how long it would take to stop the vessel, the engines being first stopped and then going astern.

The change in velocity is $V_1 - V_2$ and as V_2 is O, the whole of the energy must be absorbed by the resisting friction. Now, this friction diminishes rapidly as the speed diminishes, and will be, when the vessel stops, equal to nothing. Therefore, we must allow the average resistance to be

$$\frac{250{,}000}{2} = 125{,}000 \text{ lbs.}$$

However, while the vessel is still going ahead, due to her kinetic energy, there is an additional resistance introduced by the propellers going astern. The revolutions will at first be very slow, but will increase rapidly. The horse power developed in going astern is never more than about .66 of the E.H.P. developed in going ahead, and may be as low as .5. If we assume an additional average force of 150,000 lbs. for the engines, we may take the total retarding force as 125,000 + 150,000 = 275,000 lbs. We then have the equation:

$F \times S = \frac{Wv^2}{2g}$ where F = Resistance
S = Distance

then

$$275{,}000 \times S = \frac{10{,}000\times2{,}240\times35\times35}{2\times32.2}$$

$$S = \frac{10{,}000\text{x}2{,}240\text{x}35\text{x}35}{275{,}000\times32.2\times2} = 1{,}550 \text{ approx.}$$

This will give a distance of 1,550 feet. Of course, all would depend on the promptitude with which the engines were reversed.

Suppose the vessel was allowed to come to rest with no check at all, the distance would be about 3,400 feet.

PRINCE OF WALES LAUNCHES "CANADIAN ADVENTURER"

Christened by His Royal Highness the Prince of Wales, the steamer "Canadian Adventurer," built by the Port Arthur Shipbuilding Company, Limited, was launched September 8, 1919, at three p.m. Mrs. James Whalen, wife of the president of the company, who requested His Royal Highness to do the company the honor, carried the christening bouquet and presented the Prince with the bottle for the christening of the boat.

"I christen this boat 'Canadian Adventurer.' I wish it and all who may sail it good luck and God speed." With these words His Royal Highness the Prince of Wales broke a bottle of champagne over her stem and pressed the electric button that released the "Canadian Adeventurer" and sent her gliding down the ways into the water.



LAUNCH OF "CANADIAN ADVENTURER"

The Prince stated that this was the first side launching he had ever seen and the first launching at which he had ever officiated. He expressed his pleasure that it should take place in the very heart of Canada and also that the vessel was one of the Canadian Government Merchant Marine fleet built by the Dominion to carry Canadian cargoes to the ports of the world. He was keenly interested in the method of launching and delighted when it was explained to him that by pressing the electric button he would himself trip the trigger that would release the boat.

After the launching His Royal Highness, and the members of his staff present, complimented J. F. Paige, general manager of the company, and his organization on the success of the launching, which, they said, was most exciting and a sight they would long remember.

The "Canadian Adventurer" flew the Union Jack at her bow and the ensign of the Canadian Government Merchant Marine at her stern. Code flags stretched from stem to stern of the vessel spelled out the name "Canadian Ad-

venturer," with the flag of the Port Arthur Shipbuilding Company in the centre.

The "Canadian Adventurer" is a full canal sized ocean freighter of 3,400 d.w. tons; her length over all is 260 ft.; breadth moulded, 40 ft. 6 in.; depth moulded, 23 ft. She is built to British Lloyds 100 A-1 classification, fitout in accordance with the British Board of Trade rules. She is designed for propelling machinery to be placed amidships and to develop about 1,500 h.p.

It was fitting that this launching should take place at Port Arthur, situate as it is in the very centre of Canada, at the head of her inland lakes and inland navigation; also that it should take place at the plant of the Port Arthur Shipbuilding Company, as this company is the largest shipbuilding company and has the largest dry dock on the Canadian inland lakes. In 1918 they built and delivered six ocean freighters aggregating 21,400 d.w. tons for the Imperial Munitions Board, six trawlers aggregating 1,767 gross tons for the Department of the Naval Service of Canada, one ocean tug of 240 gross tons for private owners. This output was second to the Canadian Vickers at Montreal only for the whole Dominion. The Port Arthur Shipbuilding Company, Limited, has also the distinction of having built the largest bulk freighter on the Great Lakes, the "W. Grant Morden," a vessel of 14,000 d.w. tons and flagship of the Canada Steamship Lines freight carrying fleet, also the steamer "Noronic," the largest and most palatial Canadian passenger boat on the Great Lakes, flagship of the Northern Navigation Company's passenger fleet.

CANADIAN FIRM COMING CLOSER TO OLD COUNTRY SHIPBUILDING COST

Special to MARINE ENGINEERING

OTTAWA, September 18.—The Government is pushing on with its shipbuilding programme, and the tendency seems to be towards an improvement in the prices. They have now before them for consideration the construction of four more two-deck poop bridge and forecastle ships of twelve knots and 8,400 tons each, and the price quoted is the most favorable yet received, being about $170 per ton. The quotation is from Vickers of Montreal.

There is now only about ten per cent. difference between the quotations from Vickers and the most of building in Great Britain for standard ships, with the advantage that our standard is higher than theirs for similar ships, quotation received from the Old Country being about $166 per ton. Taking into consideration the fact that wages at Vickers in Montreal have gone up about 11 per cent., and hours reduced about 6 per cent., showing a nominal loss in production of from 3 to 6 per cent. it would appear that the Canadian builders are getting their work down pretty fine.

Australia has a very ambitious shipbuilding plan under way, and appear to be building very low, but reports are somewhat conflicting. According to official figures furnished our Canadian Department of Marine, the prices there in May ranged from $140 to $165 per ton. Since the beginning of the war the Australian Government has spent over fifty million dollars on their commercial fleet. The programme includes fourteen steel vessels, shelter deck type, 331 feet B.P., 48 feet wide by 33 feet 7 inches deep, moulded to shelter deck, from 5,500 to 6,000 tons deadweight. They are about the same as the Canadian 5,000-ton boats. The cost of these figures work out at about $141 per ton. Costs of later ships seem to have been considerably higher, but the Government there is going on with its shipping operations regardless of criticism, of which there seems to have been a good deal there as there has been in Canada of our Government programme. At present forty steamers are being operated by the Commonwealth Government, and it has also been directing the course of about nineteen ex-enemy steamers. Only ten per cent. of the men employed in shipbuilding had had any previous experience, and the Government of the Commonwealth believe that with increased experience they can reduce their costs.

There are no figures available as to the exact rates paid men engaged in shipbuilding in Australia, but the presumption is that they are considerably lower than here, although they seem to have advanced considerably since the estimate of $140 per ton for construction as above mentioned was made. Their platers, for example, average about fifty dollars per week, while ours are said to average nearly double that sum.

CORNISH SALVAGE CO.'S FEAT

One of the most interesting, and certainly one of the most difficult, salvage operations has just been completed by the refloating of the mystery ship M. J. Hedley, at Barr Dock, by the Cornish Salvage Co. (1918), Ltd.

The vessel capsized while loading in the Barry Dock last winter, and lay on her side at the bottom of the dock entirely submerged. By an ingenious multiplication of gear the vessel was slowly turned by the Cornish Salvage Co.'s steamer Zephyr, assisted by two Barry Railway Co.'s locomotives, until gradually the sunken vessel's funnel showed above water. She had then dug herself so deeply into the mud as to render it essential to employ lifting gear of even greater power, and in consequence two pairs of sheer legs were erected in the dock and before the vessel was uprighted each of these sheer legs had to exert a strain equal to those of the most powerful sheer legs of any dockyard in the world. But even at this stage the work was only half completed, as the vessel was still submerged with only her masts and funnel showing. In fact her decks were still 20 to 30 feet under water.

Lifting barges were unobtainable. and in any case, owing to the proximity of the vessel to the tip, one side only would have been accessible. The capacity of her holds had been reduced when the M. J. Hedley was converted into a mystery ship to such an extent that even if they had been pumped dry the buoyancy would have been insufficient to float her, and in any case the decks and bulkheads would not have stood the enormous pressure that such an operation would have brought on them. The use of compressed air was not a practical proposition, so after discussion with Commodore Young and some of the ablest members of his staff, it was decided to build a cofferdam round the vessel.

This huge structure, about 120 ft. long by 24 ft. wide by 30 ft. deep, was built entirely by divers working under water, and some idea of the enormity of the undertaking can be gathered from the fact that one side had to be strong enough to withstand a pressure of 1,000 tons and the whole box made watertight and fitted on to the ship. The total length of the watertight joints made by the divers was nearly two miles, and yet as soon as the company's pumps started to pump out the cofferdam they had a complete mastery over the leakage. In a few hours the vessel began gradually to upright herself and steadily came to the surface. The taking down of the cofferdam was an operation full of anxiety, as the company had to take every precaution to prevent the vessel capsizing again, and in a remarkably short space of time this cumbersome wooden structure had been dismantled and the vessel safely refloated. Every credit is due to the divers and other employees of the Cornish Salvage Co. for the excellent way in which the work was carried out. Since the formation of this company a number of successful operations have been carried out.—Liverpool "Journal of Commerce."

The Gates Refractories, Ltd., of Montreal East, are just completing a 60-ton kiln for the making of fire brick. It is expected that two others of similar capacity will be in operation before the close of the year.

If present plans materialize the Nova Scotia Steel and Coal Company will construct a by-product plant for the production of coke at an approximate cost of $2,000,000. An additional blast furnace will probably be included in the new developments.

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

THE NEWEST MARINE ASH HOIST

It sometimes happens that when a new machine or appliance has been on the market but a short time new uses are found for it, probably never dreamed of by the inventor or manufacturer at the time of its introduction. A typical case of this kind is that of the "Little Tugger" hoist brought out by the Ingersoll-Rand Company a few years ago.

The rapid development in steel and wooden ship construction in the United States and Canada has given the "Little Tugger" a chance to demonstrate its worth on a new class of service, namely, the removal of ashes on board ship. Space is usually at a premium there and the compact construction of the "Little Tugger" makes it an ideal hoist for this purpose. As an example of the small space occupied by this type of ash hoist, see Fig. 1. The hoist proper is mounted between two bulkhead stiffeners and the rope led over pulleys and down the ventilators to the stokehold. Part of the ventilator is cut away to provide an opening through which the ash buckets are placed on deck and subsequently dumped overboard. This opening is closed by doors when the ash hoist is not in use to prevent anyone falling down the shaft. The lower end of the rope, of course, terminates in a hook to which are attached the buckets of ashes to be hoisted.

These hoists are so built that the load is held in any position without the application of the brake, which is a valuable feature, especially where the hoist is provided with an extension throttle handle with control of the hoist placed outside the ventilators as shown in Fig. 2. As shown in this view, the hoists are installed inside the deckhouse and equipped with special reversible valve levers which permit extension throttle handles to be used. The operator of the hoist can thus stand under the ventilator to control the hoist, and at the same time easily keep an eye on the ash bucket as it is being raised or lowered. With this arrangement the operator has instant control of the bucket and can stop it instantly if he thinks it is going to strike the floor plates or other obstructions.

When installing the "Little Tugger" hoist on board ship the following points should be borne in mind: The Dake engine used in these hoists depends for its efficient operation on the pressure and not the expansive power of steam, and therefore care should be taken to supply the hoist with steam at a pressure sufficient to secure the desired lifting capacity. Where it is necessary to run steam pipes a long distance they should be insulated with some form of covering to prevent condensation of the steam. A by-pass should be installed between the supply and exhaust pipes so that any condensation which may gather can be readily drained, thus preventing the water from being carried into the cylinder to the drain cocks and washing out the lubricant.

This little machine, which operates on the square piston principle, is made in two styles to handle steel or manila rope and may be arranged for operation on steam or compressed air.

In order to distinguish between the machines designed for operation by steam, which are made with larger clearances than those intended for use with compressed air, the manufacturers use the symbols 1-HS and 11-HS to designate steam-driven machines, and 1-H and 11-H for airdriven machines. The 1-H and 1-HS style have a drum capacity of 700 feet of ¼ in., or 450 feet of 516 in. steel wire rope, and will lift loads up to 1,000 pounds at a rope speed of 85 feet per minute, while the 11-H and 11-HS hoists will hold 300 feet of ⅞ in. manila rope and half a lifting capacity of 600 pounds at the same speed per minute.

The "Little Tugger" hoist was primarily intended for use in prospect shafts and mines, for such work as raising and lowering timber, drills, drill steel, tools, muck, etc., and hauling small ore cars up an incline. For this class of work they have been very widely adopted, many of the larger mines using a number of them. Being light in weight and of simple sturdy construction, easily moved about and readily clamped in any position on a flat timber, or iron column of 4½ in. diameter, in any location required, it was not long before they began to be used for many other purposes besides those for which they were designed. In industrial plants they have been used to hoist shafting, pipes, and parts of machinery, as well as hauling large trucks and packages in warehouses, etc.

They are particularly adapted to installations of a temporary character, such as are usually met with in construction work. They have been applied in a variety of ways to such work as hoisting timbers and structural steel members in the fabrication of steel and wooden ships, bridges and buildings, etc., hauling rails through bending machines, pulling small cars in quarries and excavations, snaking timbers in and out of

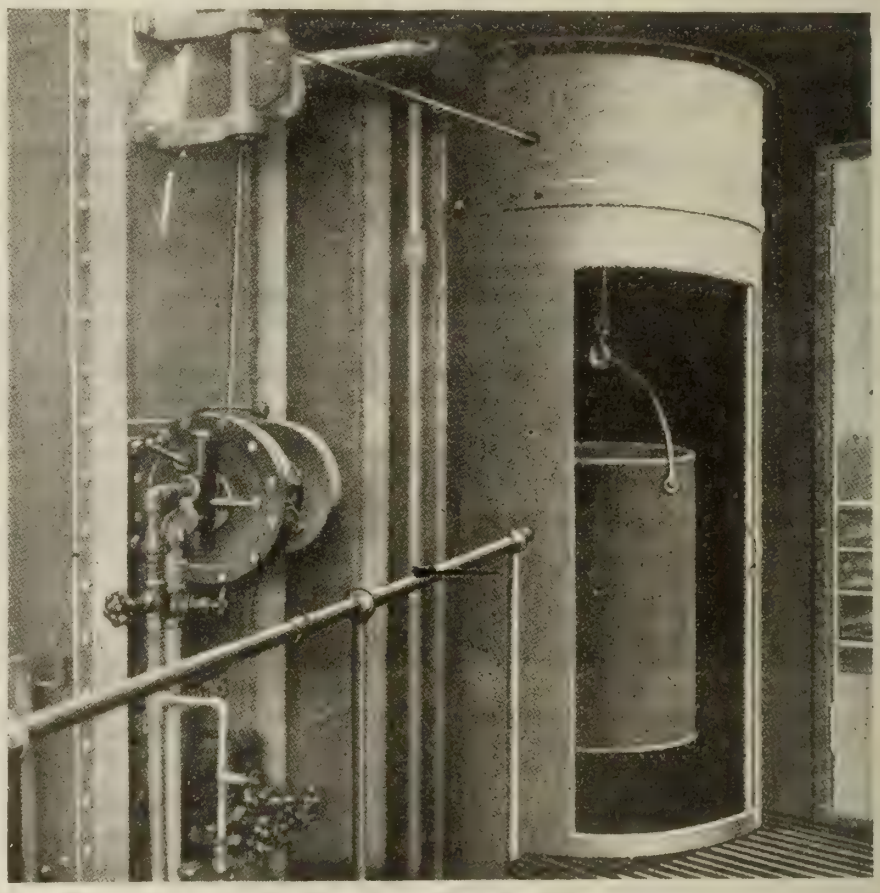


FIG. 1.—NO. 1-HS "LITTLE TUGGER" INSTALLED ON A 7,300-TON STEEL FREIGHTER, WHICH HOISTS THE ASH BUCKETS TO THE DECK, WHERE THEY ARE CARRIED TO THE RAIL AND DUMPED

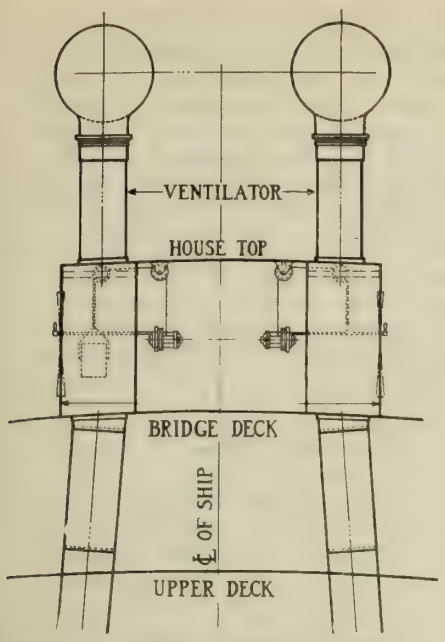


FIG. 2—DIAGRAM SHOWING METHOD OF INSTALLING "LITTLE TUGGER" HOISTS FOR HOISTING ASHES ON BOARD SHIP

steam boxes in wooden shipyards, as well as for placing many other materials in all forms of building, dam and dock construction.

There are no exposed gears or projecting levers on these hoists to injure the operator, and the whole machine being so designed as to operate practically on the "take-care-of-itself-plan," the cost of maintenance is extremely low. An interesting little booklet entitled "Billyisms," showing some of the uses which "Billy" found for the "Little Tugger" on all classes of work, has been published by the Canadian Ingersoll-Rand Co., Ltd., Montreal, Que., who will be glad to send a copy to any one who is interested in saving time in handling materials.



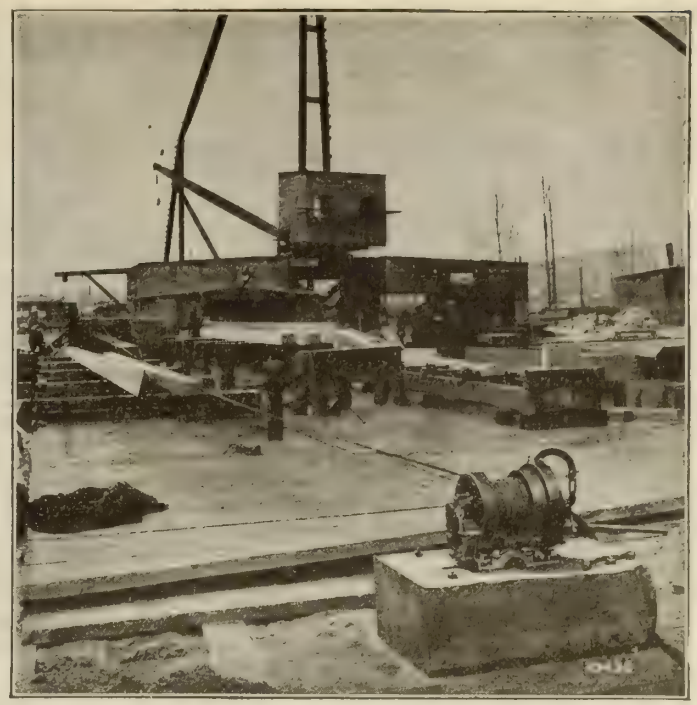


FIG. 3.—AIR-OPERATED "LITTLE TUGGER" HAULING TIMBERS IN AND OUT OF A STEAM BOX IN WOODEN SHIP CONSTRUCTION

"W & B" WRENCH BOARD

The Whitman & Barnes Manufacturing Company, St. Catharines, Ont., are putting out an attractive new board for displaying their drop-forged wrenches. The background is light golden oak, the display card is black with gold lettering.

The wrench board is designed to be of great assistance to both the dealer and the purchaser. Each wrench number is plainly marked in red. Wrenches may be had either semi-finished or black enameled finish. As the new board is only 8 inches wide by 28½ inches high, it may be used to advantage in the window as well as in its usual location on store column or walls.

The assortment of ten sizes of double head wrenches, three of each size, is not intended to be complete or to take the place of the dealer's regular stock. It does, however, include the most popular sizes for general use, and so serves as a guide to the purchaser as well as a silent but effective salesman and stockkeeper for the dealer.

A handy little booklet describing the new wrench board will be mailed to dealers on request.

FUEL OIL DANGERS

According to a memorandum issued by the marine department of the British Board of Trade, cases have been reported recently in which men employed in cleaning or carrying out repairs in oil tanks, or in working cargo in holds situated above double-bottom tanks in which fuel oil is carried, have been asphyxiated or poisoned by the fumes or gases given off from the oil or cargo. To guard against such accidents, the Board of Trade has issued the following recommendations:

When fuel oil is carried, whether in double bottoms or elsewhere, care should be exercised that the tanks containing the oil are thoroughly oiltight.

The utmost care should be taken to ventilate thoroughly all spaces in which oil has been carried, as well as any adjacent spaces in which vapor may have accumulated, before men are allowed to enter such spaces. Thorough ventilation is necessary in all cases.

MARINE BOILER EXPLOSION

Boiler Explosion.—The British Board of Trade has recently issued a report as to a boiler explosion which occurred on February 7 last on board the steamship Izaston when about 12 miles north of Yarmouth. The boiler was of the three-furnace marine cylindrical return-tube type, 15 feet 3 inches in diameter by 10 feet 3 inches long, and was built about 20 years ago. When the explosion took place a piece of the combustion chamber back plate close to one of the bottom stays of the centre furnace in the starboard boiler was blown out, forming an opening through which the contents of the boiler escaped into the stokehold. The explosion, the report states, appears to have been due to local corrosion on the fire side of the combustion chamber plate. The corrosion was probably caused by leakage from the adjacent stay.

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The Port Colborne Disaster

THE coroner's enquiry into the fatal explosion at Port Colborne has ended in the way that most of these enquiries do, by a verdict which exonerates everybody concerned, and suggests tacitly that the thing just had to happen. With this view we are not inclined to agree. During the enquiry, evidence was adduced which showed that blowers which are fitted for the express purpose of removing dust, were not allowed to be used, and that in one instance an elevator nearly lost its license through using the blowers after receiving notice to desist.

The Port Colborne elevator is under the control of the Department of Railways and is unique in that respect. However, the Board of Railways does not seem to have interfered in the use of the blowers. This action seems to be the province of the Board of Grain Commissioners, which will not allow the dust to be removed before the grain is weighed. The whole trouble seems to lie in the question of who is going to bear the loss in weight if the dust is removed before the grain is placed in the elevator, and the question is shirked in a manner that deliberately endangers human lives. The fact that the risk is always present where there is dust is amply proved by the number of minor explosions which take place, and as further proof, we have the explosion of a nest of elevators in Kansas City just a few weeks after the Port Colborne disaster. Here again the results were fatal.

Boards have been appointed to enquire into this situation, and they have sat and presumably deliberated and made reports. The evil still persists. Truly it would seem that the cheapest thing in this country is human life. While the country is filled with exhortations to count "Safety First," men are being killed by a preventable cause, which is not prevented through the greed of the principal users of the elevators. The presence of a dust-laden atmosphere whether it is coal dust, grain dust, sawdust, or textile material dust as in the New York *Triangle* fire, is a source of danger of the highest potential. Its admixture with the surrounding air is so complete, that the introduction of the tiniest spark starts combustion, which takes place so rapidly and perfectly that it is explosive in its intensity.

There may be some loss occasioned by blowing the dust, or there may be some reason apart from that of financial loss against the use of the blower. The public and the men who work in these elevators should be satisfied beyond any reasonable doubt that all necesary precautions are being taken to make their occupation a safe one.

It would seem that the phenomenon of growing old has really nothing to do with the number of years that an individual has lived, but depends principally on the extent to which he has conserved his recuperative powers. The human body wears out in two ways, i.e., either by long-continued use or by long-continued disuse. In the former case it is like bending a wire back and forth in one place until it breaks, and in the second it is the atrophy of organs or functions through disuse. The only way to stave off old age is to eliminate all forms of abuse and live as Nature intended us to live.

The term shell shock has misled many persons to believe that it is due to the profound impression or shock produced on the nervous system by the detonations of high explosives. No doubt, there are cases of actual brain or nerve injury due to concussion of the air accompanying shell explosions, but these mechanical causes are a great deal less frequently responsible for war neuroses than the mental effects of general war strain. It is remarkable that these war neuroses, common as they are among privates and officers alike, are seldom found in men who have been actually wounded. Perhaps this seeming anomaly is due to the actual wound shock offsetting the mental impression affecting the controlling nerve-centre in such cases.

"Jackey" Fisher and Oil Engine Development

By T. H. FENNER, Editor Marine Engineering

WHATEVER one may think of Baron Fisher of Kelverstone's revelations, credit must be given him for wielding a trenchant pen. There is also little question that the policy of concentrating the fighting strength of the Royal Navy in the North Sea was an absolutely correct one, though it called forth some very bitter criticism when first adopted. Much of this emanated from holders of sinecure positions in the dockyards scattered over the Empire in remote spots. The civilian population of the dockyard towns also lost a great deal of easy money when these bases were reduced to a skeleton establishment. Men who had been drawing pay from naval dockyards in Bermuda, Halifax, Esquimalt, etc., in return for spending a few leisurely hours daily in these places, were faced with the necessity of going to work in earnest. The presence of the staff, and the frequent calls of the vessels on the station meant good business for the local tradespeople. There was, of course, much criticism from disinterested people all over the Empire, many of whom thought the calling home of the fleets from the outer marches of the seas would diminish the prestige of Great Britain among the nations. Events have proved that Fisher was absolutely right, and the presence of the Grand Fleet in the North Sea on Aug. 4, 1914, was one of the deciding factors in the ultimate victory.

However, when he speaks about the British attitude on the oil engine there is room for serious difference with him. In his vigorous language, he formulates the statement that "This British nation is going to make the same —— mess over the internal combustion engine, which is just as imperative for commerce as for war. Every nation except ourselves is pushing ahead with this engine."

This is far from being the truth. It is true that for the duration of the war British engineers were too fully occupied in absolutely necessary war work to devote much energy to commercial work. Notwithstanding this, oil engines in Great Britain have been brought to a state of efficiency second to none.

There are a large number of firms building marine oil engines, both under license and of all-British design. Distinct types and designs have been evolved, and at least one invention has been brought forward that marks a considerable advance over anything yet achieved. We allude to the Still engine, of which numerous descriptions have been published lately. Some of the largest engineering firms in Great Britain have gone in whole-heartedly for the manufacture of both marine and stationary engines. Among these are the well-known names of Vickers, Cammell, Laird & Co., Beardmore's, Doxford's, Robey's, etc. The smaller class of marine motor for fishing and pleasure boats has for many years upheld the reputation of British builders all over the world. In engines for motor cars and aeroplanes Britain is behind no other nation. The name of Rolls-Royce stands for the highest efficiency in this direction. Coming back to the use of oil engines in commercial vessels, the largest and highest powered oil engined ships afloat are under the British flag, built on the Clyde. The "Glenapp," of 10,000 tons deadweight, and 6,400 B.H.P., has not yet been surpassed. Evidently Lord Fisher has not looked as closely into this question as he might have done, when he says, "We have no big ship so fitted, or even thought of."

There is a distinct field for the marine oil engine, but as far as can be seen at present it does not lend itself to the propulsion of high powered war vessels. As a motor for cargo vessels, of moderate speeds, it would seem to be the ideal. The advantages it has are of economy in fuel due to its high efficiency as a heat engine, economy of space, reduction of engine room crew, largely increased cruising radius. This latter effects economies by eliminating stops at coaling ports, with their attendant expense of pilotage, dues, and long delays. Against these advantages conservative ship owners have considered the almost perfect reliability of the old triple expansion steam engine, which carried their vessels on voyages running into years with safety and immunity from breakdowns. The marine oil engine, being in the development stage, was susceptible to breakdowns, especially such serious ones as broken crankshafts, which caused owners to look askance at it. However, these early difficulties are fast disappearing, and we now see firms like the Glen Line going in for oil engined fleets.

Where the oil engine's real limitation appears is in the size of the units which are practically possible. In the vessel referred to, the "Glenapp," the 6,400 horsepower is divided into two units of eight cylinders each. The horsepower developed in each cylinder is thus about 400, which is as large a unit as has been considered possible. Owing to the high compression pressures used and the pressure on bearing surfaces entailed, the making of larger units is hardly feasible. However, were it possible to make engines developing 1,000 horsepower per cylinder, consider what would be required for a battle cruiser developing 100,000 horsepower. That would mean 100 cylinders, with their necessary air compressors, air vessels, etc. Speaking at a recent discussion on the Still engine, Sir Charles Parsons made the interesting statement that to obtain the maximum power for a large cruiser the design would call for 150 cylinders on four shafts.

The writer is an admirer of "Jacky" Fisher, who unites the qualities of the old-time sailor with the breadth of vision of the engineer. However, he cannot subscribe to the great sailor's opinion that Great Britain is going to be hopelessly left in the oil engine developments of the future.

THE Ontario Safety League are out with a bulletin which says a man should not spit on the floor at home or in the shop. Well, if a man can't spit on the floor of his own parlor then things are coming to a funny stage.

* * *

A SPEAKER at the Ottawa Industrial Conference said it helped not at all to give a man a 20 per cent. wage increase while he at the same time faced a 40 per cent. increase in the cost of living. To be sure, most of us would get out and holler for a 40 per cent. increase in wages, with living costs stationary or shrinking.

* * *

MEMBERS of the Dominion Government are working hard to qualify for a sessional indemnity of $2,500 each. They have got to get in 30 days, by hook or by crook. And so the country, up to its neck in debt, faces the beautiful spectacle of a House held in session, with, at times, speakers blazing away to 16 of the 230 members, hoping and praying that they can stick it out long enough to pocket the $2,500. How can Ottawa expect the rest of the country to take big matters seriously with a cluster of time-servers assassinating enough time to legally put them on the sessional pay roll?

* * *

THE explosion in the elevator at Port Colborne seems to have been due to the fact that blowing dust out of wheat makes it lighter. Being lighter, there is a loss of money. Therefore, the dust must stay. Dollars and dust win out against lighter grain and safety. The coroner's jury whitewashing all and sundry is a poor compliment to the intelligence of the community. It is certainly the bounden duty of some official of the Government to explain why they are afraid to order the dust blown out of wheat.



Canadian Merchant Service Guild Constitution

Herewith Is Presented the Constitution and Articles of Association of the Guild—Members Are Requested to Forward to the Guild Secretary Any Suggestions for Amendments Before October 31.

IN order that members of the three branches of the Canadian Merchant Service Guild may be familiar with the constitutions as they exist at present, we are publishing them in this issue of the GUILD REVIEW. In this way members of each branch can compare the other constitutions with their own, and thus be enabled to make suggestions leading to the adoption of a set of rules and regulations that will be acceptable to the members as a whole. In order to make these suggestions of value, members are requested to forward their ideas to the respective secretaries not later than the end of October. The officers of the Guild are looking forward to the time when the members will be so strong in every seaboard and lakeshore constituency that they will be able to elect a member to represent their views on the floor of the House of Commons. In this way, and only this way, can the seafaring profession expect to attain their rightful status, in the affairs of the Dominion. We believe that even at the present time that any member of the seafaring community who would stand for election could be elected. There is no man better qualified to be a member of Parliament than a seaman, whose training is so conducive to quick thought and action. We would like the seamen of Canada to take as their motto the words, "There's Nothing We Can't Do," and keep that motto ever in their mind's eye.

To take the position that should by rights be theirs in the community, and uphold the prestige of the profession, it is necessary that the slackness of past years be overcome, and the seamen banded together in a strong organization. In this way the prestige and prosperity of the profession will be assured. In this connection we are here publishing a draft of a Merchant Shipping Bill, on which we should like to get the opinion of members at the earliest possible moment, and not later than October 31st. The bill will, after being brought up to the best possible state, be presented to the Government, with a view to it being embodied in the law of the country. If we can present this bill to the Government with the knowledge that the seafaring profession is solidly behind it, we can demand its speedy passage. Seamen are always willing to help the Government to the best of their ability, but in a matter of vital importance to their profession, they will tolerate no delay.

Article 1.—The organization shall be known as the Canadian Merchant Service Guild, and the objects for which the Guild are formed are to unite into one solid body those employed on board our Canadian merchant vessels. This will enable them to demand and obtain a direct voice in the making of the laws, rules, regulations and conditions under which they must carry on the marine transportation of the country, and to improve the position and status of their profession. The Guild will also provide legal defence in professional matters to members when so arranged by those in charge of the different sections.

Sections and Boundaries

Article 2.—The Dominion of Canada shall be divided in three sections, namely, west section, centre section, and east section, the west section to include all Canadian territory west of the 100th meridian, the east section to include all Canadian territory east of the 70th meridian, the centre section to include all Canadian territory between these two meridians.

Membership

Article 3.—Active members may consist of masters, mates, pilots and junior officers, who are, or have been, actively employed in our merchant service, when they comply with the rules and regulations governing the section in which they reside, and the above members only shall have the right to exercise the use of their vote. Associate members may consist of any British subject domiciled in Canada, and honorary members may be enrolled at the discretion of those in charge of either section, but such "associate and honorary members" shall not use their vote, nor enjoy the full privileges of membership, neither shall they be allowed to attend meetings of the Guild unless invited to do so by those in charge of the section wherein they reside.

No individual will be admitted to the Guild, either as active, honorary, or associate members, who are in any way whatsoever affiliated with labor organizations.

Appointment of Officers

Article 4.—Each section shall have the power to appoint their own management board by a majority of votes polled by the active members residing in that particular section. To qualify for nomination a member must be of the Anglo-Saxon race, holding a certificate of competency, issued under the jurisdiction of the British flag, who is, or has been, in active service as a master or officer on board a British-owned vessel while holding such certificate. The secretary-treasurer may consist of any private individual, but in such case he shall not have the use of his vote, and he must agree to give his word of honor that he is not, nor shall, while holding the office of secretary-treasurer, be in any way whatsoever affiliated with labor organizations.

The management board of either section so elected may give their several positions any name most suitable to themselves, and the length of time this management board will hold office shall be left to the discretion of the members eligible to vote in each section, and all retiring members from the management boards shall be eligible for nomination and re-election.

Powers Granted to Management Board

Article 5.—When the management board of either the west, centre or east section has been appointed according to the requirements of this constitution, such management boards shall then have power to make, alter or amend any rules, regulations or conditions as may be necessary, or in force, in the section they have been elected to govern. A majority of the members eligible to vote may at any time desire such alterations, additions or amendments to be made, but great care must be used so that such new rules, regulations or amendments shall not in any way conflict with this constitution, which must be regarded as the supreme law of the Canadian Merchant Service Guild throughout Canada.

Annual Subscriptions

Article 6.—The management board of each section shall have the power to name the amount to be paid as annual subscriptions by all members residing in the section they represent, and may make any arrangements for collecting the same they may consider most suitable to the members living in each section.

Finance

Article 7.—The management board of each section shall have power to control the finances of the section they represent in any way they may consider to the best interests of the members living therein.

If it should be found necessary to create a fund for any special purpose, and the same has been mutually agreed to, by the management board of each section, a joint account shall be authorized and all money deposited to that account shall be under the control of three trustees, one to be appointed from each section, who will be required to place a detailed report of all monetary transactions regarding this account before the management board of each section not less than once each year.

If at any time such joint account should cause grievances or dissatisfaction amongst the members residing in the different sections, then all money deposited to such joint account shall at once be equally divided, and the members in each section may dispose of their share as they think fit.

Salaries

Article 8.—The management board of each section shall have the power to fix all salaries and wages in connection with their own staff. They shall also have power to deal with any resignation or dismissals of any members of their staff, with power to pay all expense incurred in carrying on the business of the Guild in their section, or to draw up any scheme for the purpose of providing funds for the benefit of the Guild in the section they represent.

Local Appeal

Article 9.—When the management board in any section wish to make a monetary appeal to the members or communities living in that section the management board must first take a vote amongst themselves, and on receiving a two-thirds majority, the appeal may be made and all money collected in this way shall be used for the benefit of the Guild or its members in the section such appeal has been carried out.

Appeal to the Guild at Large

Article 10.—An appeal to the Guild at large may be carried out after it has been mutually agreed to by a majority of votes from the management boards of the three sections, and an account of all funds collected through such an appeal must be placed before the management board of each section and shall then be deposited in a chartered bank of Canada as a joint account and shall be placed under the control of three trustees, one to be appointed from each section, and such funds shall only be used for the benefit of the Guild at large, the disposal thereof must first be agreed to by the management boards of the three sections.

Organization of Sections

Article 11.—Each section shall be divided by the management board into either divisions, branches or districts as they may see fit, the same to be under the control of a local board, consisting of a chairman, secretary and not less than three other officers whose positions and duties will be designated by the management board of that particular section, and this local board must be appointed by a majority of votes in the division, branch, or district they are to represent, and when so appointed must carry out the rules and regulations laid down by the management board for the section of which they form a part and must at all times be guided by the management board of that section, with regard to matters pertaining to the Guild, either financial or otherwise.

The term of office allotted to such local boards must be limited to not more than twelve months, but the retiring members shall be eligible for re-election.

The Guild in Council

Article 12.—The management board of each section shall meet together at such time and place for the despatch of business and regulate their meetings in any way most suitable to themselves, and the local boards representing any branch, division, or district, within either section shall have the privilege of regulating their meetings in whichever way they consider necessary to the best interests of the members residing in the branch, district or division they represent.

At every meeting of the management board in either section five shall form a quorum, and no business of importance to the Guild shall be taken up or voted on with less than this number in attendance.

At meetings of the local boards representing any branch, division or district, three shall form a quorum, and must be in attendance to take up business matters in connection with the Guild in whatever branch, district or division they supervise, and for the purpose of debate the following rules shall, as far as possible, be adhered to at all council meetings of the Guild throughout the Dominion of Canada.

The chairman must keep order, be strictly impartial, take no part in any discussion, and he shall have no vote but the right of casting vote.

Members must speak one at a time, keep to the subject, and speak not more than once on a motion. They will be allowed five minutes to speak, or longer, at the discretion of the chairman.

If there is an admendment to a motion, or an amendment to the amendment, then the amendment to the amendment shall be put first.

Members who wish to take part in a debate are not eligible for the chair.

In carrying out these rules, the chairman should, at his discretion, allow as much freedom as possible, providing it does not conduce to disorder, and before putting a vote to the meeting he should ascertain if all who desire to do so have spoken on the subject under consideration.

There shall be submitted to such meetings a report showing the work of the Guild, and the proceedings of the management board, either by or through the secretary, and such meetings of the Guild shall be empowered to make any recommendation or suggestion for the consideration of the management board they may think desirable, and at any such meeting it shall be competent for the Guild in council to ask the management board to reconsider any question or action the management board may have decided on, and on such request the management board may alter or amend any decision they had come to as they think fit, and if two-thirds of the management board consider the subject so referred to of sufficient importance, then it shall be decided by a majority of votes from the members, either in that section, or, if necessary, from the Guild at large.

Joint Representation

Article 13.—When matters of importance have to be taken up for the benefit of the Guild at large, each section may, if necessary, appoint a representative to meet at a place and date which will be named when mutually agreed to by the management boards of each section.

The subjects to be discussed by these representatives must first be taken up by the members in each section, and a decision arrived at so as to enable their representatives to bring forward a report somewhat favorable to the majority of members in each section. These reports will then be discussed conjointly by these representatives, and their decision must be placed before the management board of each section for approval before taking action unless it has been mutually agreed that their decision shall be final.

Legislation

Article 14.—No business of a nature requiring legislation shall be placed before either the House of Commons or the Minister of Marine and Fisheries until it has been approved and signed by the secretary, president or chairman of the management board of each section. This becomes necessary so that our seamen may have the full power of their organization to back up whatever reasonable request they may wish to put before their legislators.

Aids to Navigation

Article 15.—When aids to navigation, such as lights, buoys, fog signals, charts or other necessities of the same nature necessary to the safety of life and property afloat may be required within the jurisdiction of either section, the management board of that section may, if so desired, take the matter up with the proper department at Ottawa, without consulting either of the other sections.

Convention

Article 16.—A convention may be called to meet at any time or place, after it has been mutually agreed to by the management board of each section, and all districts, branches or divisions within each section having seventy-five members eligible to vote or over shall have the privilege of appointing a representative to attend that convention.

The expenses of the management board and all such representatives delegated to attend the said convention shall be paid from the funds of the section wherein they reside. All members of the Guild eligible to vote shall have the privilege of attending the convention, if they so desire, at their own expense.

Funds and Property

Article 17.—In case of the dissolution of the Guild, or amalgamation with any other body, all funds and property held in trust for the Guild at large, either on deposit, in banks or otherwise, shall be equally divided, each section getting an equal share.

All funds and property then held in trust by the management boards of each section shall be deemed to be the property of the members residing therein, and the realization, distribution, disposition or transfer of any such property, effects and funds, shall be disposed of according to the wishes of the members eligible to vote in each section.

Auxiliary

Article 18.—Provision in this constitution is hereby made for the formation of an auxiliary to the Guild in all, or any of the three sections, when the management board may consider the same advisable.

This auxiliary will include as its members, all seamen who are not eligible to vote in the higher grade of the organization, and it shall be known as an auxiliary to the Canadian Merchant Service Guild.

In sections where this auxiliary may be contemplated, the management board shall draw up rules and regulations to govern the same, and all annual subscriptions, or taxes, levied on its members shall be paid into the funds of the section to which it belongs, and it must at all times be under the control, and supervision, of the management board for that section.

Its members on attaining the higher grades of their profession will, at the discretion of the management board, automatically pass on to the higher grade of the organization.

When this auxiliary has been established in any section, it will then become the duty of all masters and officers who are members of the Guild to use this auxiliary, as much as possible, when engaging their crews.

Legal Representation

Article 19.—The management board of each section may make any rules, or regulations, for conducting cases of legal defence they may consider advisable for the members in the section they control. If a member should have to come before a tribunal in a section other than that to which he is affiliated, he should inform the secretary of that section, as soon as possible, so that arrangements be made with the section to which he belongs for his legal protection. For this reason legal defence rules should be as near uniform throughout the Dominion as existing conditions will allow, and to insure this co-operation the following rules are inserted as a guide to the Guild at large:

Legal Defence Rules

Article 20.—Members of the Guild whose subscriptions are fully paid up according to the by-laws of the section to which they belong, at the time a casualty occurs, are entitled to legal assistance, at courts where a member's certificate or professional ability may be in danger, within the Dominion of Canada.

Members who are expecting to be called before a tribunal, for which they may be held responsible, should at the earliest time possible, send in to the secretary full particulars as to the time, place, and cause of the accident, and who was in charge at the time it happened.

Legal defence cases may arise, through members having to collect wages, salaries, salvage, or compensation through accident while engaged in their professional duties, their vessel being stranded, or getting into collision, or other causes pertaining to their professional affairs.

In cases where members are in some professional trouble, and are doubtful how to proceed, they will, on application to the secretary of the section they may be in at the time, be advised as to the best course to take, and if it is thought necessary, the opinion and advice of the Guild solicitor for that section will be obtained.

The management board of any section shall reserve to themselves discretionary powers, in dealing with cases, other than cases where a member's certificate, or profes-

sional ability may be in danger, which they may consider of exceptional importance in the interest of the profession, and the Guild at large.

If a tribunal should be likely to take place, the member concerned must keep the secretary informed, as to any developments which may arise, and particularly so, when the date, time, and place of the tribunal is fixed; the secretary will then make all arrangements for the member's defence.

It is of the greatest importance, that every member should carry with him, the receipt for his current year's subscription, as it may avoid considerable trouble and complication.

In making out statements for legal defence, members should not forget, that an unavoidable accident, or an error of judgment is not punishable, but that breaking the law by not using the lead in cases of stranding, going full speed in fog in cases of collision, or neglect of duty, is punishable, and that more than 70 per cent. of certificates suspended throughout the British Empire have been through one of these causes.

Article 21.—No alteration, additions, or amendments can be made to this constitution, until they have been mutually agreed to by the management boards of the three sections.

Ritual

Article 22.—This ritual shall govern all business sessions, in every branch, division, or district, throughout the three sections, also all business sections of the auxiliary grade of the organization, whenever it may be put in operation, in any of the three sections:

1.—Chairman opens meeting.
2.—Reading of minutes.
3.—Correspondence.
4.—Reports from management board.
5.—Reports of committees.
6.—Secretary's report.
7.—Unfinished business.
8.—New business.
9.—Items of interest for the welfare of the organization.
10.—Adjournment.

Ritual for the Management Boards Throughout the Three Sections

1.—Chairman opens meeting.
2.—Reading of minutes.
3.—Correspondence.
4.—Accounts.
5.—Applications, or dismissals of members.
6.—Reports of Committees.
7.—Unfinished business.
8.—New business and welfare of the organization.
9.—Adjournment.

The purpose of these rituals, is so that meetings of the organization throughout the Dominion may be in keeping one with the other, and for the convenience of members who are eligible to attend such meetings when visiting from one section to another.

Proposed Shipping Bill To Be Presented

The Canadian Merchant Service Guild Have Here Drawn Up a Bill to Be Submitted to the Minister of Marine and Fisheries—Subject to Approval of Members.

To the Honorable Minister of Marine and Fisheries, Ottawa.

WE, the seamen of Canada, under the auspices of the Canadian Merchant Service Guild, after a great deal of deliberation, wish to inform you that the whole aim of the institution is to co-operate and do all in their power to assist you, in every way possible, to work out and solve the great problems you have in hand. With these aims in view, your seamen desire to put the following suggested reforms to our mercantile marine profession before you for your consideration and opinion:

First—That a consultative committee should be appointed, made up from all branches of our shipping and seafarers, each branch to be equally represented.

We as seamen believe that carrying our produce under our own flag is the only means whereby we can ever expect to secure and maintain the international power and prestige necessary to our very existence, and that while we allow our exports to be carried under alien flags are undermining the security, not only of ourselves, but that of our future generations.

The responsibility of carrying on our merchant service rests primarily with the men who run the ships. Therefore, we would suggest a committee as herein mentioned to work out the details of any proposed measure, and give the Government the benefit of their experience.

Manning of Our Vessels

Clause A—Second—That every Canadian vessel licensed to carry 100 passengers or over be provided with a master and first mate, holding a certificate of a grade not lower than that of first mate, and a second mate, holding a certificate of a grade not lower than that of second mate.

Clause B—That every Canadian vessel of 500 tons gross tonnage or over, chartered to carry cargo or otherwise, propelled by machinery or sail, shall be provided with a master, and first mate, holding a certificate of a grade not lower than that of first mate, and a second mate, holding a certificate of a grade not lower than that of second mate.

Clause C—That every Canadian vessel of 1,000 tons gross tonnage, chartered to carry passengers or freight, shall be provided with not less than five seamen, and not less than one additional seaman for every 1,000 tons gross tonnage or part thereof over and above 1,000 tons up to 7,000 tons gross tonnage. All vessels between 1,000 tons and 200 tons gross tonnage be provided with not less than three seamen, the same to constitute the minimum number of seamen on board every Canadian vessel of 200 tons gross tonnage or over, and that not less than this number be inserted in the ship's articles before the master be granted a clearance for his vessel.

Such seamen to be designated on our inland waters as wheelsmen, watchmen and deckhands; in our coasting and foreign-going vessels as able-bodied seamen, the ability of these seamen to be left to the discretion of the master and his officers.

Clause D—That every Canadian vessel of 50 tons gross tonnage or over, propelled by machinery or sail, shall be provided with a master, and first mate, holding a certificate of a grade not lower than that of first mate, issued for the class of vessel on which he may wish to serve.

Clause E—That every Canadian vessel of 15 tons gross tonnage or over, propelled by machinery or sail, shall be provided with a master holding a certificate of competency issued for that particular class of vessel.

Clause F—Fishing vessels solely employed in fishing shall not be required to comply with these regulations, but every Canadian vessel, no matter what her employment or class may be, of five tons registered tonnage or over, shall be in charge of a person who has proved before an examiner of masters and mates that he can pass the

color and vision tests, having a thorough oral knowledge of the rules and regulations regarding lights and signals, that he is a Canadian or has his naturalization papers, and is fully conversant with the English language, and that all permits as master be discontinued as they fall into the hands of individuals who are incompetent and naturally become a menace to the safety of life and property afloat.

Do we realize that when our vessels leave port their crews consist of a master, a mate, and two engineers, neither junior officer, seamen, nor firemen are necessary so far as our laws are concerned at the present time? It is true that the Canadian Shipping Act requires a sufficient crew to man the vessel. Surely that cannot be law. You have your idea of what that crew should be; we have ours, and our employers have theirs. Should our Government leave room for an opinion on a subject of such vital importance to the safety of life and property afloat?

In our coasting trade, if a seaman has served four years afloat, or on our inland waters, two years, one of which he must have been steering on board some vessel over a certain tonnage, and can pass the required examination, our Government says he is qualified to take charge of a vessel in the absence of the master. Is it possible that this man could realize the responsibility placed on his shoulders with regard to the safety of life and property afloat without having had any experience whatever as a junior officer? Supposing the mate of a vessel being off duty getting a much-needed rest. The master has been standing in charge of his vessel for many hours either through bad weather or other causes and is also in need of rest. He must leave his vessel in charge of a so-called second officer, who, so far as our Government is concerned, need be neither more nor less than a seaman or deckhand, if he has such men on board. If not, what then? This man, as master of his vessel, knows his responsibility, and he must stay there until he drops.

If one of our younger men should go before an examiner of masters and mates to take his examination as mate, this examiner tells him he must first show twelve months as wheelsman on board some vessel over a certain tonnage, yet when we look through our mercantile marine law we can find no such position mentioned therein. If one of our young men, either serving on our inland waters or coasting trade, wishes to take his examination as master of one of our larger vessels, this same Government official will tell him he must state on his discharge whether he has served as first mate or second mate on board his former vessel, and when we look up the laws of our mercantile marine all we can find in connection with this matter is that every Canadian vessel over a certain tonnage shall be provided with a master and a mate, neither a first mate nor a second mate is asked for, simply a mate.

Why should this Government official have the right to ask these men to qualify for their examinations in positions not provided for by the Government, of which he is an employee?

Inspection Laws

Third—That the inspection laws regarding our vessels be remodelled to make it compulsory that no Canadian vessel shall be exempt from inspection except those built and armed for defence.

The word "Hull" to be erased, and the word "Equipment" substituted therefor, and that no person shall be eligible for a position as equipment inspector, unless he holds a certificate of competency as master, and can pass a thorough, up-to-date examination on that subject.

Under our present system anyone, regardless of qualification, so long as he can pass an old, obsolete examination, may be placed in a position as hull and equipment inspector. Is it possible any one man can fill these two positions with any semblance of efficiency, and if efficiency is not forthcoming, does it not leave the way open to serious damage and possibly loss of life and property?

If a hull inspector is necessary, should it not be some person who is fully conversant in the art of building our modern vessels?

Fourth—That our mercantile marine law shall make it compulsory for every Canadian vessel, chartered to carry cargo or licensed to carry passengers on our inland waters and coasting trade, to be provided with a disc on her side amidships to indicate when they have been loaded to a safe and seaworthy draft of water.

Under our present law, let us say, we bring our vessel into her loading port, how are we to tell when this vessel has been loaded to a safe and seaworthy draft of water? We have no ruling whatever to guide us, only in a very few cases the law of nature, that is, when our vessel has to pass through our rivers or canals we know when she is down to the draft of water required to pass through either of these places we must stop loading. Is she now submerged above a degree of safety to life and property or is she not? We have no means of telling, and if she has not to pass through either of these places, then, even if her deck is submerged, she is safe and seaworthy so far as our Government is concerned.

Fifth—That the master, pilot, or officer of our vessels shall have the right to appeal to the Admiralty Court if they should consider themselves unfairly dealt with before our courts of enquiry.

With the present ruling on this subject, if the master, pilot, or officer should get their vessel into trouble through foundering, stranding or otherwise, and escape with their lives, they are called before a tribunal to have their professional ability pried into by men who have been educated into the higher grades of their profession, who would naturally ask such questions as, "How many of a crew had you on board your vessel?" "What freeboard had your vessel on leaving her loading port?" and many other questions of the same nature. To these educated men these questions are vital in so far as safety to life and property is concerned; to us these questions have no meaning whatever, as we have no laws to govern them, and if either of these men should be censored and possibly deprived of their means of making a living for themselves and families, their Government say that decision must be final and they shall not have the right to appeal to a higher court of justice if they should consider their case unfairly dealt with.

How can we build up our mercantile marine profession under such laws, rules, regulations and conditions, or under such, what class of men will be attracted to the profession you must rely on to carry the flag we all honor and respect from sea to sea throughout the world's commercial trade routes, demanding that recognition and respect due to Canada and her people?

Sixth—That all Canadian seamen should be admitted free of charge to hospitals throughout Canada, when taken sick on duty, and receiving a certificate stating that hospital attention is necessary, the same privilege to be extended to fishermen and lighthouse keepers.

When we take into consideration that these men are, in practically all cases away from home, without friends or money, together with the value of their very hazardous employment to Canada and her people, would it be too much to ask that they should receive this recognition to encourage them in the both dangerous and arduous work of carrying on our international trade and commerce instead of leaving them either to fight for themselves or at the mercy of perhaps the unscrupulous?

Honorable sir, we your seamen beg that you may see your way clear to use your whole power and influence to grant these reforms, and by so doing assist the seamen of Canada to draw themselves out of that most deplorable, stagnant, disorganized condition into which they have fallen through neglect.

West Section

Signed .....

East Section

Signed .....

Centre Section

Signed .....

SEAMANSHIP AND NAVIGATION

Conducted by "The Skipper"

Articles of direct interest to mariners, discussions of seamanship, navigation rules, and allied topics. Inquiries from readers are invited and will be replied to promptly through these columns, unless otherwise requested.

JOINING a ship for the first time as an officer is an ordeal fraught with imaginary difficulties, as well as real ones. You are a complete stranger to the master and mates, and the ship, apparently, is of a type that seems strange when compared to the one or two vessels which have so far been your floating home. While it is customary in many lake boats for the captain to have his uncle as cook, his younger brother as mate, and his nephew as wheelsman, and thereby throwing off the complete stranger conditions above mentioned, the ship manned by cousins and aunts is not fit to sail in. There are only two branches of shipping where the family business should be allowed and that is in fishing fleets and inland waterway barges. In all other spheres of marine activity the best thing for a young officer is to throw him into a strange ship amongst strange superiors.

We will say that you have been sent to Montreal to join one of the Government's new steamers from the Canadian Vickers yard. As she is to run in the West Indies-Halifax route your brand-new coasting certificate is sufficient recommendation, and with a letter of introduction to the captain, you are already climbing the gangway. As a rule, the master can be found in the vicinity of the navigating bridge, and when a flunky has directed you still further, be prepared to break the ice properly.

"Good morning, sir, my name is Jones, from Toronto."

"You are the new third mate, then?"

"Yes, sir."

Nowadays a decent skipper will shake a young man's flipper and say something encouraging to him, such as, "You'll find your berth in the starboard alleyway, Mr. Jones. I'll come and make you acquainted with your brother officers."

"Boss shell-backs" of the old type only condescended to shake hands with marine superintendents and owners of ships, but the tramp steamer has changed this "king of an island" into a genial and common-sense skipper, who is only too anxious to encourage initiative and healthy ambition among his officers. That in no way kills the animal known as discipline.

If the steamer is not yet out of the builder's hands it is likely that the chief mate will just tell you to "Keep your weather eye open and get the lay of the things which will come directly under your supervision." Such an opportunity is a gold brick, so let us ennumerate some of the items in question.

First of all, see how she is moored, so that in the event of shifting ship to another dock for bunker coal or outward cargo, you could appear conversant with the necessary manoeuvres. The different leads from mooring pipes and the bitts or bollards at your disposal, along with the winch leads, are all important studies to a stranger on a new ship.

Next to mooring gear get a line on cargo possibilities. Note the number of hatches and mark mentally those having bulkheads. Scan the winch and derrick arrangement, noting where guys should set up to, and how the derrick will hang and swing to work properly in each cargo gangway.

Get familiar with the bunker hatches also, and if you rub up against an engineer, ask their capacity. Then wander on to the navigating bridge and drink in the whereabouts of the whistle and lanyards, telegraphs, compasses, telephones, steering wheel, azimuth and binocular boxes and the whole equipment of a modern bridge—even to the type of lifebuoy and how it is thrown

The great point to remember is that young men entering any profession have to learn by investigation and experience, therefore they must be active in searching for knowledge. The fact and reason that one takes things easier when up the ladder a bit is simply because a certain amount of knowledge for all predicaments has been absorbed and is ever ready for putting into practice.

The steering engine is worth an examination, not from the view of the operating engineer, but as to where and how the clutches work which puts the steering from a steam to a hand motion. Also note how the chains are secured to the barrel, and where the oil pockets are on the wheelhouse shafting.

In conversation with the senior mates get to know if the builders are supplying a capacity blueprint for each hold, and a tonnage draught diagram, two handy references to hang up in the wheel house or chart room. This will show that you have an eye and mind to business, and that brass buttons and attitude are not your only qualifications. Never attempt to keep yourself in the tranquil pose of a gangway purser, who may be doing his duty with a geranium in his buttonhole and whose three-inch collar would strangle a giraffe. The less frills a third or second mate has, the better he will be thought of and the more he will be able to pick up in his business.

As the stores come down to the ship, you would be expected to take charge of and put in a suitable place such things as patent leads and logs, flags, rockets, danger signals and small boat gear. It would be in your favor to suggest making a hand log and hand lead and we had better rehearse the work.

How to Make a Hand Log

Never imagine that in these mechanical days you can do away with the old-fashioned things altogether. Hand logs and, of course, more so, hand leads will always be in use at sea and entering ports.

The hand lead is about 7 pounds in weight and is used in shallow waters, where it is necessary to take soundings frequently. It should be hove on the weather side in a sailing ship, but in steamers, unless she is in ballast and a high wind is blowing, any side will do, especially the side on which you anticipate shoal water. This hand line is long enough to allow of soundings being taken up to 20 fathoms, or 120 feet. The marks are as follows:

At 2 fathoms, 2 ends or fingers of leather.

At 3 fathoms, 3 ends or fingers of leather.

At 5 fathoms, white rag (linen).

At 7 fathoms, red rag (bunting).

At 10 fathoms, leather-tailed disc with hole in it.

At 13 fathoms, blue rag (serge or flannel).

At 15 fathoms, white rag (linen).

At 17 fathoms, red rag (bunting).

At 20 fathoms, cord with two knots in it.

Thus there are 9 "marks" and 11 "deeps." The latter measurements have to be gauged by sight and are 1, 4, 6, 8, etc. In some ships the deeps are easily known by inserting into the strand of the hand lead line short ends of marline or spunyarn, but this is optional. To a practised seaman, even in the dark, the different cloths, as well as their color, are distinguishable.

Open out your new line and put a large eyesplice in the end for slipping over the becket of the lead. Then stretch the line and soak it in water. After that make your chalk marks on a deck seam and mark them plainly that no mistake can enter the important line. Tuck each mark in its respective place with a good grip under the strands. Leave the lead itself out of the measurement, as that allows any error to safeguard the ship, whereas if the marks were too short it would indicate the water to be deeper than it really was. Besides a hand lead each tramp steamer should have a harbor lead line made of stout fishing cord and marked in some intelligent way from 5 to 50 feet. Where harbor master's data is absent as it often is in foreign ports, the mates will find this a handy guide before shifting from one berth to another, should no one

seem to know the depths. With a small boat crew and a harbor lead line much danger has been avoided by a preliminary survey.

The Hand Log

This line, if marked for a 14 second period or sand glass, should have equal spaces of 23 feet 6 inches between knots. The principle on which the hand log line is marked is this: The length of each knot on the line must be in the same proportion to a nautical mile as the number of seconds of time, or the glass is to an hour, thus: 3600:14::6080.

Marks on the Hand Log Line

Measure off 12 to 15 fathoms of stray line to take the log ship clear of the stern eddies. Mark this drift measurement with a white rag, which is really the beginning of the line. Each mark on this line is equi-distant:

At 1 knot, 1 small leather finger.

At 2 knots, 2 small leather fingers.

At 3 knots, single knot of small cord or marline.

At 4 knots, 2 knots of small cord or marline.

At 5 knots, single knot again.

At 6 knots, 3 knots in cord of marline.

And so on up till the tramp speed of 10 miles an hour.

Remember at times when you have to reverse the engines at sea, or when you run into ice to haul in the patent log line, otherwise you may lose it, and get more hand log drill than you want. Say that you had no logs on board at all, how could you find the approximate speed? I don't mean by asking the engineer. Just see how long (in seconds) it takes for a floating article to come from the ship's stem to her stern-post. Then, knowing the length of your ship and the number of feet in a sea mile, the answer is obtainable. A canvas or wooden log ship give the same results.

The chart room must now be made ready for the steamer's departure, and our junior officer has been told off to see that things are shipshape in the navigation sanctuary. Get the proper charts out and lay them on the table as far as Anticosti in the Gulf of St. Lawrence. Being from a navigation school you will have a good idea what to put handy, soft lead pencil, rubber dividers, parallel rulers, lighthouse book, latest notices to mariners, etc. See that a "scrap log book" makes its appearance; also azimuth tables and deviation book. If the old man is rooting around, don't ask any questions, unless of an appropriate kind, such as, "Are the chronometers coming on board to-night, sir?" He may be glad you were interested in the clocks and say, "Yes, and be good enough to notify the chief mate to that effect, as he will take care of them at all times."

On leaving port it is customary for the third mate to be in attendance on the bridge, either handling the telegraph as per instructions or guarding the steering, and as time goes on you get familiar with your new surroundings. From the moment that you have any dealings with the seamen be short and businesslike and leave it at that. As you are the junior mate any "fresh" or insubordinate forecastle hand would likely practise on you, so from the moment you come in touch with the crew, just be natural, but never familiar—it breeds contempt.

The hour finally comes when the master asks you if you have had any experience in keeping a watch, as every good modern tramp gives its officers the three-watch system—4 hours on the bridge and 8 hours off. Be frank and religiously honest in what you tell him, for he will hang around the lower bridge for a few evenings in your 8 to 12 watch to see how you get along.

Try and be very steady in your Rule of the Road movements, bearing in mind that it is not necessary to port or starboard for every opposition light that comes your way. Use the bearing method for lights that need close attention, and after you put in a few nights and days amongst the traffic you will find out that great numbers of vessels come within your range who couldn't hit you if they tried.

In relieving the bridge, be ahead of time and the mate will often give you pointers, and try and enter up the scrap log book with short, but accurate writings. If a night order book is kept, and the entry is too long to remember, make a rough note of it in your pocket diary and that will prevent you from coming off the top bridge to have a second glance at it. Call the captain ten times without very great reason, rather than bring disaster on the life and property in your charge; the old man will thank you for such procedure.

It is possible that the skipper will trust you to take the chronometer times as he uses his sextant for morning longitude observations. During the forenoon watch be sure to work up several azimuth bearings for checking the deviation on the ship's head. The sea formula for azimuths and amplitudes is learnt in one minute, the long methods used at examinations being thrown overboard and short rules adopted. The Burdwood or Davis tables are used in this connection, while the ship's time, sun's declination and an approximate latitude are the necessary quantities to enter the tables with.

Sextant Work

Of course, you will have a sextant with you and the first thing to do before bringing the sun down to the horizon is to find your index error. Don't monkey with the adjusting screws till you have a year's experience. I have used a sextant for at least fifteen years and have never had a larger index error than 2 or 3 minutes of arc. To apply this correction in its + or — proportion to your sight readings is far simpler than tampering with the screws on the horizon or index glasses.

To find the index error of a sextant by the horizon, clamp the instrument with O of the vernier at O on the arc and look through the telescope at the horizon. If the true and reflected horizons are in a continuous line, your sextant is correct. If the horizons are not in a straight line move the tangent screw till they come together. The reading thus obtained carries a + sign if it is off the arc, but — if on the arc. In learning to shoot the sun for observations, make slight sweeps with your instrument to see that you have the heavenly body in its perpendicular plane, or unless the sun, moon or star is observed at the precise spot on the horizon the reading is of no use. Only practice can aid you in this sailor work. In taking the meridian altitude of the sun at noon, don't be afraid to wait a minute or two after the more experienced officers have gone, and you will actually notice the sun sinking in the water, which, of course ,indicates that it is on its p.m. journey. The highest reading for each noon at sea is the principal figure for finding the latitude. As the third mate is frequently on the bridge at the day time reliefs, make it a practice from the start to insist on the quartermasters repeating the course given, to you as well as the other helmsman. And judge the steering by glancing astern from time to time. A ship's wake is the real telltale in steering, not her head. The great fault of all bad helmsmen is in giving her too much wheel, and every young officer should be able to make the man who can't steer stand aside until he steadies the ship on her course and keeps her there on small helm, thus showing that it is quite possible to steer straight.

Boat Measurement

To find out the carrying capacity of your boats, measure the length, breadth, and depth for cubic contents, and then multiply them together and by .6. Then for every 10 cubic feet allow one man. Say your boat was 25 x 8 x 3 = 600 × .6 = 360 = 36 men.

As the voyage goes on, the mate will introduce you to a cargo plan and perhaps ask you to make a diagram of the hatches, which will be under your charge in harbor. There may be four or six ports of call and it is very expensive and awkward if cargo is carried beyond its own destination, so this work and its worries are amongst your pet hobbies. It is best to see things for yourself and not trust to the foreign stevedores, so don't be shy in running up and down the hatches which are in your charge, thus noting the different parcels and what is happening to them. No matter where the trouble is—in the hatch, lighter, or at a winch or derrick—the cry will be, "Where's the third mate?" If you are matched against a native tallyman, who has been at his job for years, the tallying alone will take up more than your attention, for many of these fellows would cheat a ship's officer out of a ten-ton steam boiler, let alone a small case of sundries.

The diagrams show you the motions

(Continued on page 46)



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MARINE NEWS FROM EVERY SOURCE

During the month of August 22 vessels, with an aggregate tonnage of 49,661, were launched from shipbuilding yards on the Clyde. Of these vessels 11 were for the Admiralty.

The total is a big increase on the July figures, which showed only nine ships, aggregating 29,886 tons.

Of new work on hand the Fairfield Shipbuilding & Engineering Company, Ltd., have nine large steamers.

Toronto.—The Toronto Drydock Co. is quite busy. Small craft, such as harbor tugs and private yachts, are being overhauled, and there is promise of considerable activity here during the fall and winter months.

Ottawa.—A board of conciliation has been appointed to investigate the dispute between the Port Arthur Shipbuilding Company and its men. The board will consist of Mr. Justice McLennan as chairman; D. W. Davies, who will represent the company, and W. M. Welsh for the employees.

Ottawa.—A new chart of the eastern part of Lake Erie has been issued by the Department of Naval Service of Canada. This chart embodies the latest information compiled by the Canadian Hydrographic Service, and forms part of the series of charts published by the department of Canadian waters.

Detroit.—The Northern Navigation Company has made an offer to the Board of Commerce to moor one of its steamers at the foot of Bush Street to act as a hotel boat for the winter. Details have not yet been worked out, but it is thought that the suggestion is a good one to relieve the congestion in Detroit's hotels.

Sarnia.—The D. & C. steamer running between Mackinac Island and Detroit has been removed from the service, due to an accident which resulted in the damaging of one of the paddle wheels. This has made the task of caring for the tourist traffic more difficult. Sixteen Pullman cars were added to one train at the time of the accident.

St. Thomas.—A Dominion Government engineer has arrived at Port Stanley and is engaged in making soundings in the river and harbor. These soundings are in connection with the abutments of the proposed bridge which is to take the place of the present structure. This looks as though the Government was at last going to do something towards the much needed harbor improvements.

Victoria.—Another record was established at the Foundation Co.'s plant when the steamers "Ottawa" and "Canada" were both tried out in one week. The "Ottawa" is the fourth vessel of this firm's building to have her trials this month, and the eighth vessel of the contract for the French Government. The first of these vessels, the "Winnipeg," is berthed at the wharf of the Victoria Chemical Co., where she is loading a cargo of lumber.

La Hague.—The Hamburg-American line offices in Holland are being closed up, and the staffs dispersed. There are so few ships left for them to handle that offices are no longer necessary. The first German vessel to sail since the war left Hamburg recently flying the German flag. She is bound to the United States with ballast, and will load oil and machinery there for Germany.

Montreal.—A new line of cargo carriers running between Canada and Norway will be inaugurated shortly. The summer port will be Montreal, and the winter port St. John, N.B. The line will be operated in conjunction with the Canadian Pacific Ocean Services. The first sailing will be from Norway, and will be made by the Ravenfjord, leaving Christiania about Oct. 10th, calling at Bergen, and arriving in Montreal about Oct. 20th. It is probable that when the business develops that a passenger service will be included.

Detroit.—President Livingstone of the Lake Carriers' Association has received a communication from the Department of Marine and Fisheries, Ottawa, informing him of the decision to disarm all Canadian steamers forthwith. On all ships of over 4,000 tons register the gun seating is to remain, and the stiffening in all cases, except those of ships under 1,000 tons register. In this class of vessel it is to be removed only where it interferes with passenger or cargo space.

London.—The position with regard to the German tonnage to be divided among the Allied nations is a difficult and delicate one, according to an official of the Ministry of Shipping. There seems to be no doubt that Great Britain will demand from 2,500,000 to 3,000,000 tons as her share, and even at that would still be the loser by about 5,000,000 tons. On the question of other nations benefiting at Britain's expense in the allocation of shipping, the official said that was the fortune of war. He said that the advantage so apparent on paper to the Americans, was not so great as it looked. The ships they were getting were nearly all large passenger liners and so looked big to the public eye. Great Britain needed, and had, a large fleet of cargo carriers.

Quebec.—The crew of the steamer "Chelston," ashore at St. Paul, Magdalen Islands, have been forced to abandon the vessel due to bad weather. If the strong winds and heavy seas continue it is quite probable that the ship will break up.

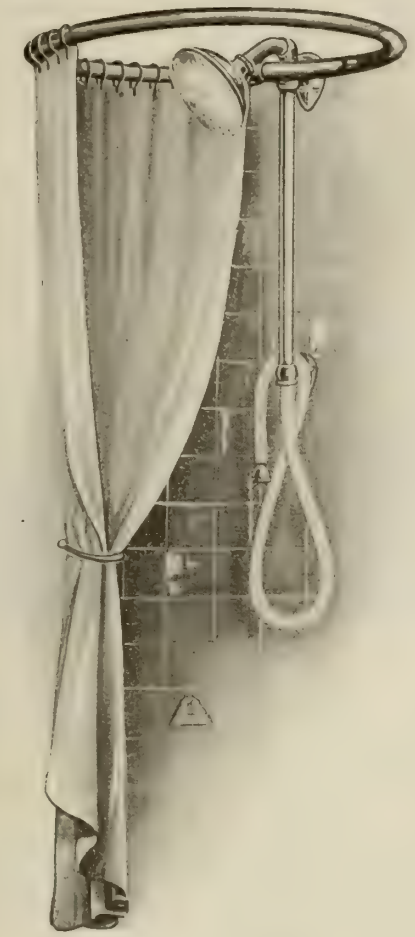
Trenton.—A new steamer service will be inaugurated between Trenton and Montreal shortly. The steamer Imperial, 200 feet long and 578 tons, will make the first sailing from Montreal. The service will be an independent one, and the "Imperial" will be commanded by Capt. Rinfret, formerly captain of the "Alexandria."

Vancouver.—Another of the Foundation Co.-built French ships is on her way to France with a cargo of B. C. lumber. She is the "Hudson," and will be followed shortly by the "Winnipeg." The "Montcalm" and "Ontario" are also ready to load, while the "Trois Rivieres" is ready for trials.

Vancouver.—The first Canadian Government steamer to make a sailing to the Orient will be the "Canadian Raider," which will be put on the berth in Vancouver about the middle of November. She will load general cargo for Australia and New Zealand, and her capacity will be 5,100 tons. She is now under construction at the Wallace Shipyards. She will load in the Antipodes for Vancouver after her outward cargo is discharged.

Big Increase in Canal Shipments.—Figures for August traffic on the Lachine Canal show a good increase on any month since the commencement of the war. The traffic has not yet reached pre-war dimensions, but is showing a steady inclination to reach those figures. Grain carried down the canal for the month of August, 1918, was 1,180,574 bushels, while for August, 1919, the amount was 3.731,427 bushels, an increase of 2.550.583. Coal, on the other hand, showed a heavy decrease. The figures for August, 1919, were 188,956, against 347,807 tons for August, 1918.

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SEAMANSHIP AND NAVIGATION

(Continued from page 324)

of the sun as seen by a sextant and should greatly help beginners, who take their place on the bridge or quarter-deck for noon observations of latitude, i.e., the meridian altitude of the sun.

Diagrams

In the North Atlantic the sun appears to act in the heavens as you see it in the drawing, the earth revolving on its axis, causing the orb to sweep the firmament with a semi-circular motion.

The first sun on the left is rising out of the sea and gives the bridge officer an opportunity to work up an amplitude for compass correction—deviation.

The second sun on the left is in a good position for a.m. chronometer sights for longitude.

The third sun on the left is good for the shadow pin or azimuth mirror or pelorus—compass correction.

The sixth sun is ready for the problem known as "reduction to meridian." This is only used where the sun is likely to be obscured by clouds at exact noon.

The central sun marked noon is the highest sextant altitude for the day and is called the "meridian altitude."

In the curve to the right the positions are the same, only the orb is sinking instead of rising. L shows the p.m. chronometer sights and the last sun is the setting amplitude bearing. Note the sun at noon bears true south.

Now take the lower half of drawing. Take your sextant and look on the horizon at south, the ship's time 11.45 a.m. The sun will appear, as you arrange your instrment properly, to kiss the horizon as at A. In a minute or two look again and Old Sol has climbed to B. Take a turn on your tangent screw and get her down again where she appears at A. This performance goes on till about 11.59 a.m. when the sun gets sluggish and eventually you cannot note any more rising. She just hangs stationary as at C. This is local noon and 8 bells are struck. C represents noon.

Turn to D and this is how the sun will appear in your sextant mirrors at 12-1 or 12-2 p.m., and very soon she will be sinking in the sea part of your reflectors till she gets to F, and so on.

The A and B suns are rising and have to be constantly screwed down, hence your readings on the sextant arc becomes larger and larger till the stationary period at C.

The p.m. suns are falling and until sunset all sextant readings will decrease.

Have an old silk handkerchief and a bit of chamois in your sextant box and never allow the arc, vernier or mirrors to get dirty. The colored shades are not so important.

The line marked south at noon is the observer's meridian, an imaginary line running through the ship to the poles and cutting the equator at right angles

Always remember that the sextant gives you the angular height of the celestial bodies and such readings from the arc and vernier depend, of course, on the ship's latitude and the sun's declination. Thus the sun can make its apparent sweep in the heavens at any noon altitude, although it need not be overhead as you see it in the drawing.

Question.—As this diagram is for the northern hemisphere and the angular height of the sun appears to be 90° (overhead at noon) what would the approximate latitude be on your ship if the date was June 21?

Answer.—On June 21 Old Sol is nearing his most northerly fence, the tropic of Cancer, which is 23° 28′ north latitude. Then it must be obvious that if you got a sextant reading of 90° on that date your latitude figures would be very close to the sun's declination, 23° 28′ N. Is that clear? It shows plainly the constant relationship between the ship, the sun and the earth. The 3rd mate of to-day is the captain of to-morrow.

SHOP TRAINING

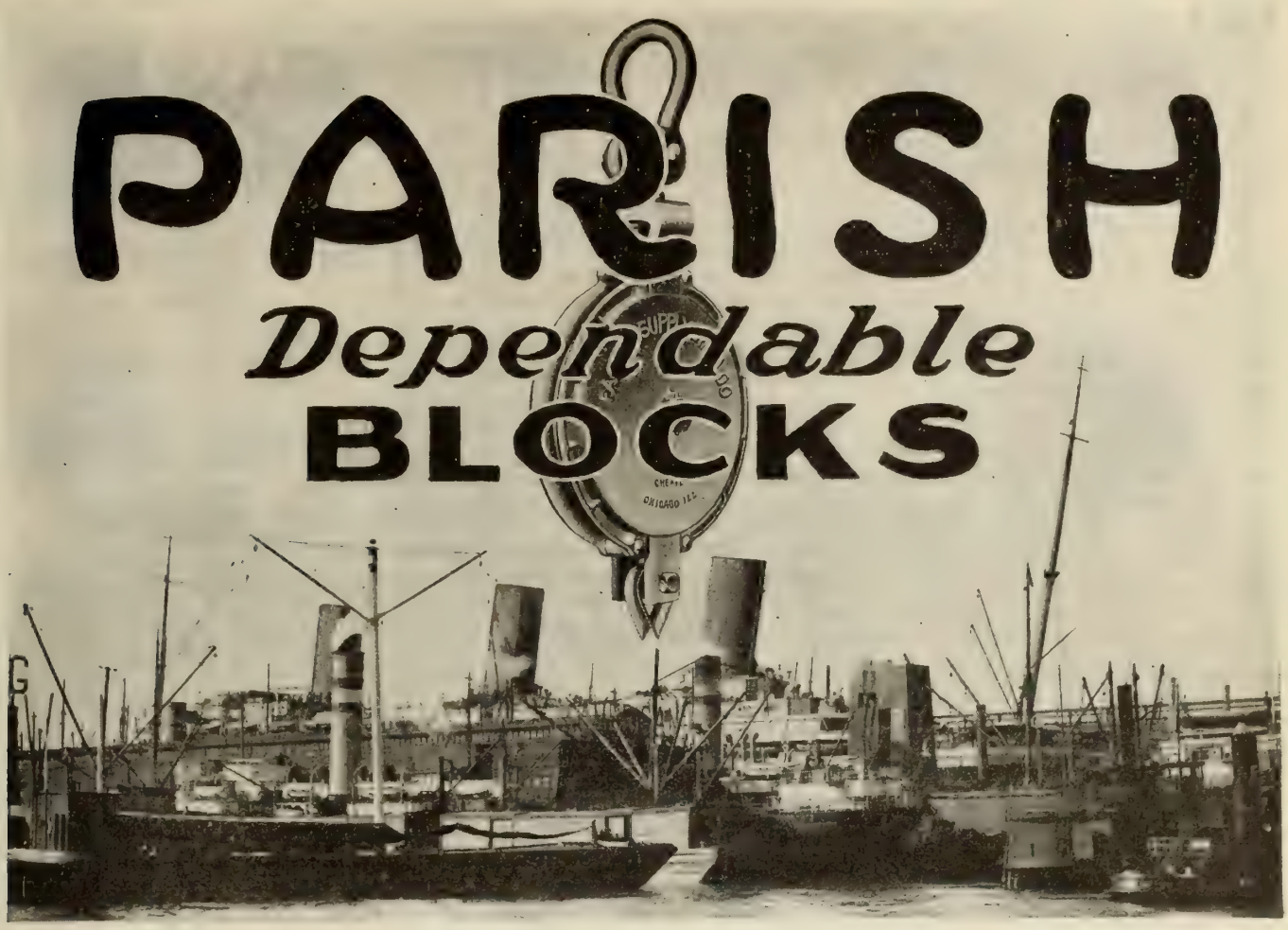
A Shop Foreman writes:—How great is the number of minor, yet essential, operations which require the closest observance in respect of details of work passing through a machine shop, but which, though so necessary, have no place in textbooks nor in the ordinary curriculum of technical schools! So much is this the case, and so true it is that such knowledge of things requires to be "handed out" or handed down" and is not learned from textbooks nor in technical schools, that the writer, among the hundreds of mechanics who have come to work under him has found that the men who came "sailing into the shop," carrying a loud and expensive cabinet of tools, were of all the most generally incompetent. These men came from technical training places and were students, in a way, of the various textbooks; but when they came to work in our shops they could not hold a candle to the boys in the shops, and were subject to considerable ridicule all around, and, of course, soon found the position untenable and had to leave. The writer, far from decrying the man who studies and masters textbooks, or in no way inclined to depreciate the undoubted value and use of technical training schools, wonders how it is that the majority of those (with whom he is acquainted) who have come direct from such schools into our shops do not make equal headway to the lads who start to learn first in the shops. The difference is unimaginable. The lad who starts in the shop, he who makes friends with the shop men, and who "scrounges" for himself, and learns to do without that which he cannot get, improves by leaps and bounds, where the one who comes from school, with his honors thick upon him, simply "sticks"—yes, sticks. He has got a bit too high (in his own estimation) and he finds it difficult to retrace and begin at the necessary "bottom." These things are true, and it is an accepted fact that "managers'" sons and technical school graduates make the least headway generally of all the boys the writer has had under his charge in various parts of the country. Of course, there are, happily, some few exceptions. They—these managers' sons and technical school graduates—are sometimes a veritable nuisance to a shop foreman. You cannot punish them anyway. One, the other day, loafing about after he had spoiled a simple job, was hailed by his foreman thus: "You loafing rascal, spoiling work and lazing after. Why don't you buck up and try and improve yourself? What will become of you later? You will never be any good." The cheeky rascal answered quietly: "Well, I can be a manager, can't I?" Yes, possibly; but in the writer's opinion it would save a lot of hard words and ultimate strife if every lad who came into the shops to work became efficient, and in an equal degree each and every manager of an engineer's shop would find it a useful asset were he a first-class mechanic.—"Practical Engineer."

Regulations have now been laid before the British Columbia Legislature in which there is to be the provision that every winding rope shall be given a bath in hot oil before being installed; that every winding rope shall be recapped at intervals of not more than six months; and that no winding rope which has been in use for more than two years, or which has been spliced, shall be used for raising or lowering persons. No cable is to be used for more than two years for raising or lowering persons. In this country the Royal Commission on Mines in 1909 recommended that winding ropes should be allowed to be used for three years and six months. To prevent crystallization of chains it will be provided in the new B.C. regulations that all cage chains in general use shall be annealed once at least in every six months, and detaching hooks shall be cleansed and refitted once in every three months.

Messrs. Burmeister & Wain, Copenhagen, are reported to have produced a special type of slow-speed long-stroke motor to replace the machinery in steamships. The new engine is a six-cylinder model, and is built in powers of 750 i.h.p. to 24,000 i.h.p. Full power is developed at 70 to 84 revolutions, a speed which will allow the existing shaft blocks, stern tubes, and large propellers being utilized. These low-speed vessels will naturally occupy more space than the high-speed types, but the conversion will still bring about a very considerable increase in the carrying capacity of the ship, while also giving her a very much greater radius. Another new Burmeister & Wain engine takes the form of a high-speed six-cylinder submarine set developing 450 b.h.p. at about 500 r.p.m. This particular Diesel was produced some years ago at the request of the Danish naval authorities.

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Toronto. — The Canadian Government now has fourteen vessels carrying Canadian produce and manufactured articles all over the globe, and before the winter is over expects to have thirty-one vessels in commission. The operating policy of these vessels is to make them supplemental to private tonnage, and not a competitive one.

St. Catharines.—The "Dalhousie City" was unable to make her usual trip to Toronto from Port Dalhousie owing to propeller trouble. The dry dock at Port Dalhousie was engaged, preventing her being put in there for examination. Failing the necessary repairs being carried out expeditiously another steamer will be engaged to carry on the run.

Sydney, N.S.—A new drydock for the harbor of Louisbourg will be started by the beginning of 1920. The dock will cost $5,000,000 and the capital interested will be mostly English. Plans and specifications have been placed before the Federal Government, and the signing of a subsidy contract is all that is necessary, previous to work being commenced.

London.—The firm of Harland & Wolff are still expanding. They have now acquired two more yards on the Clyde, those of D. & W. Henderson Ltd., and A. & J. Inglis. They recently acquired the yard of Caird & Company, and are said to be interested in other Clyde yards. They are now strongly entrenched in Liverpool, Southampton, on the Clyde, and at their original works at Belfast.

New York.—Captain W. Hays, of the famous "Olympic," is coming to the States to enjoy a vacation on a New Jersey farm. Capt. Hays wears the Distinguished Service Medal for the services he performed in his gallant ship. She transported 250,000 troops, bagged five German submarines, and travelled 350,000 miles without convoy and without accident.

Ogdensburg.—The crew of the steamer "Toltec," of Buffalo, were landed at Ogdensburg by the Canadian Government steamer "Alert." The "Toltec," which was a wooden vessel, was on a voyage from Montreal to Buffalo in ballast, when fire broke out in the engine room. It spread so rapidly that nothing could be done to suppress it, and the vessel was beached near Prescott. The "Toltec" was owned by the O'Hagen Co., of Detroit.

Montreal.—The "Lake Fibre," built at Toledo, is now in Montreal loading a cargo of Canadian food products for Glasgow, Liverpool and London. The "Lake Fibre" is under the control of the United States Shipping Board and is one of the smallest of the ocean-going boats built on the lakes. She is of 1,588 tons net register, and her deadweight capacity is only 2,500 tons. She is fitted with oil-fuel and her winches are driven by gasoline engines.

Improvements at Water Front — The Toronto Harbor Commission have under consideration the construction of improving the harbor facilities in front of the Exhibition grounds. The idea is to construct a retaining wall at which ferry boats could land passengers from the city, and embark returning visitors for transportation to the city. The chief engineer will present a report shortly on the probable cost of the undertaking.

Montreal.—That there is plenty of cargo space available for shipments going to England is the statement of shipping company's officials. According to these gentlemen shipowners are looking for cargoes, and they are at a loss to find any explanation for the cry that has been going up about lack of space. The British Ministry of Shipping has cabled Canadian offices that they expect to be satisfied with 50 per cent. space instead of the 60 per cent. they have been using.

Halifax.—Work at the Halifax shipyards is being carried on vigorously. The office and stores building are completed as far as the exterior work is concerned,. The concrete retaining wall is being rapidly completed and the bridge over the railroad tracks to give access to the dock and shipyard is now floored and the sidewalks put in. A flight of steps will lead from this bridge to the north ferry. The steamer ferry "Scotia" is in the dry dock receiving an additional fifteen feet to her deck.

Kingston.—The "Cabotia," which went ashore on the Main Ducks, about 500 yards from the lighthouse, is in about 12 feet of water and resting on rock. She is a total wreck, being full of water, and her stern opened up very badly. The Donnelly Wrecking Co.'s steamer Cornwall hastened to her assistance when she first went ashore, but owing to the high seas could not get alongside of her for some hours. She then took off the captain and crew and such equipment as could be readily handled. The cargo will be salved as soon as arrangements are made with the underwriters.

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27,500 lbs...	.9375"	15/16"
46,750 lbs...	1.000	1"
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26,000 lbs...	1.375"	1⅜"
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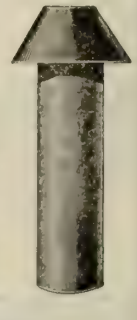
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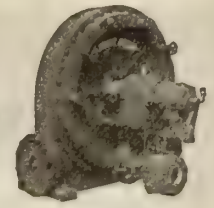

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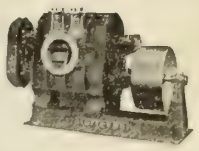

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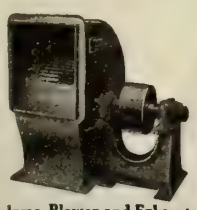
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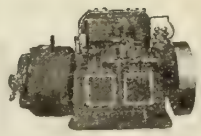
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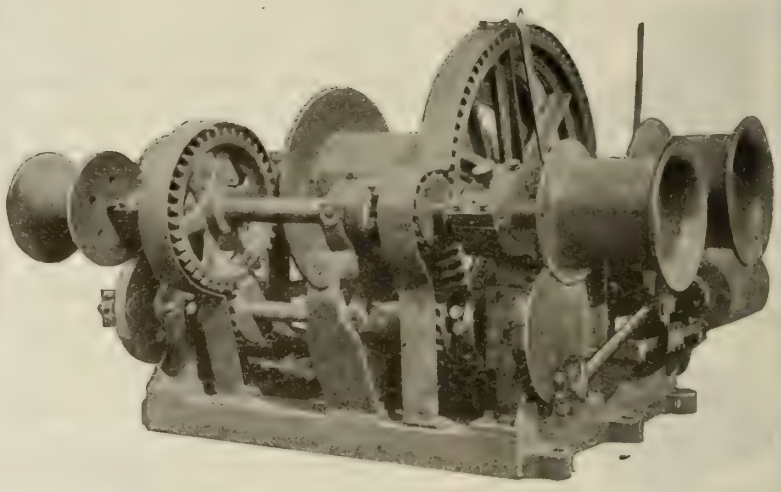
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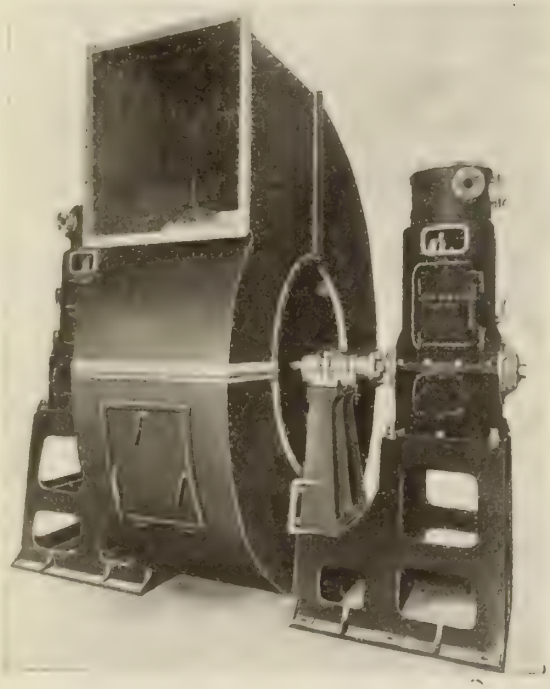
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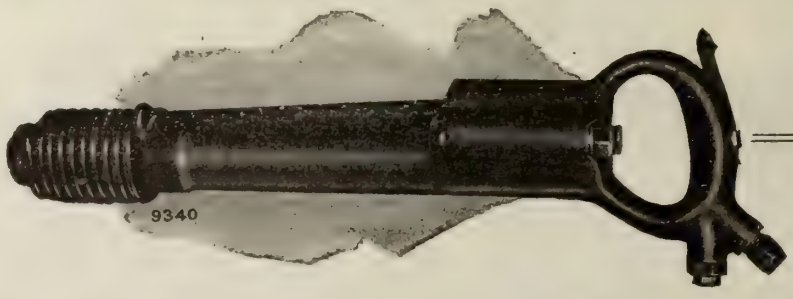


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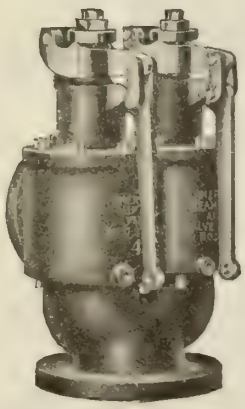
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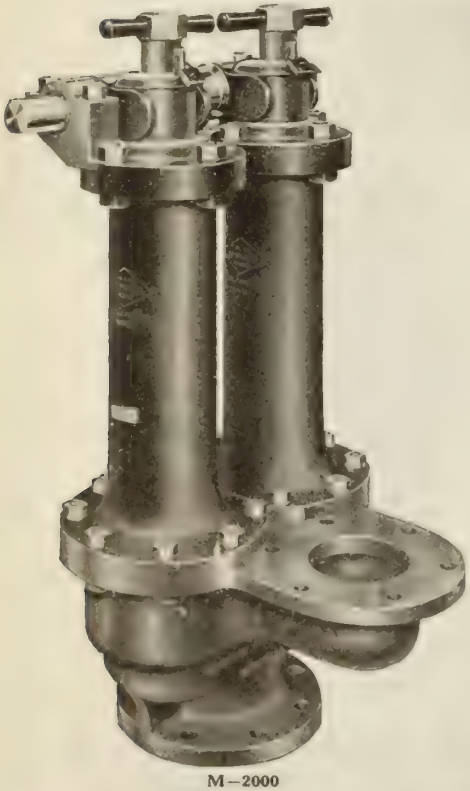
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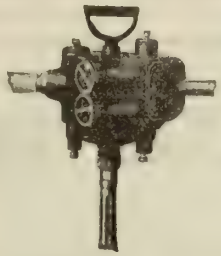


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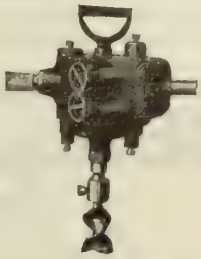


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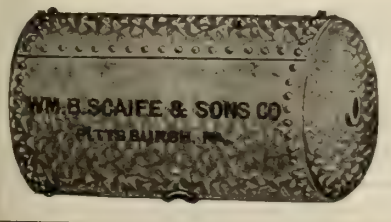
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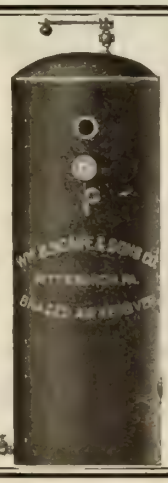


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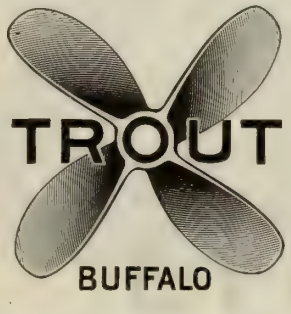


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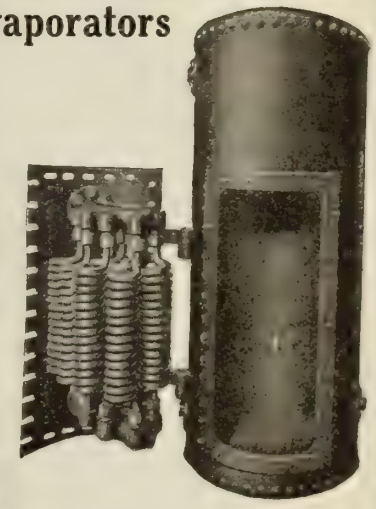


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Read this story of "Klondyke" Boyle, by Arthur Beverley Baxter, in September MACLEAN'S—it starts on page 13.

"Growing Under Gouin"

—tells the amazing story of development of Quebec Province during the past fourteen years —in road-building, finances, industries and education.

"Meet Mr. Habitant"

—What does the rest of Canada know about the Habitant of to-day? Does he talk like Drummond's poems? This article, by Thomas M. Fraser, forcibly depicts the assets Canada has in French-Canadian stability and thrift, and will go far to remove any lingering prejudices which may exist in some minds.

Other Big Features

The Crowning of the King—By J. K. Munro, the pungent, pithy, political pundit.

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The White Eagle at Niagara—By Major C. R. Young, late adjutant Polish Army Camp.

The Problem of Our New Canadians—By Nellie McClung.

His Majesty's Well-Beloved—By Baroness Orczy.

Canada's Great National Asset—By D. B. Hanna, president Canadian National Railways.

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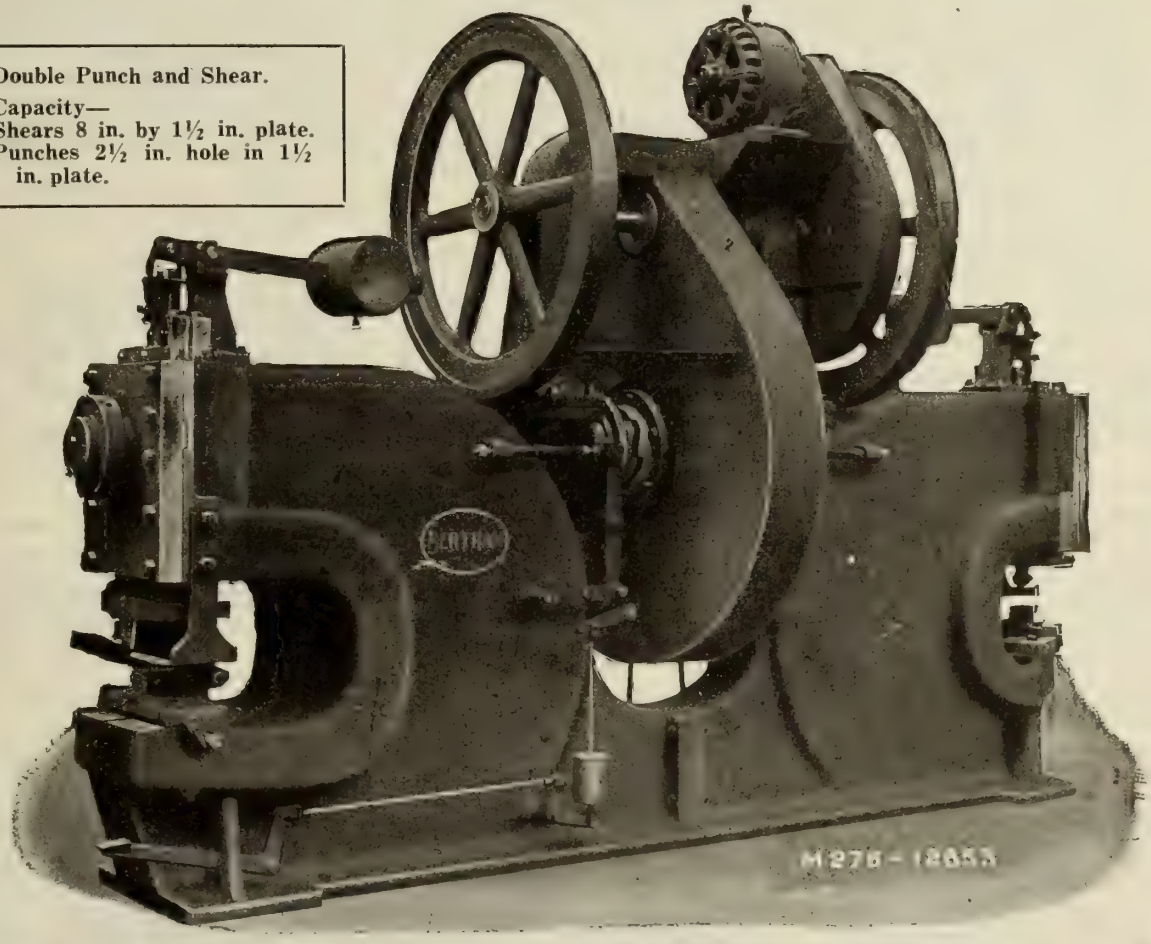
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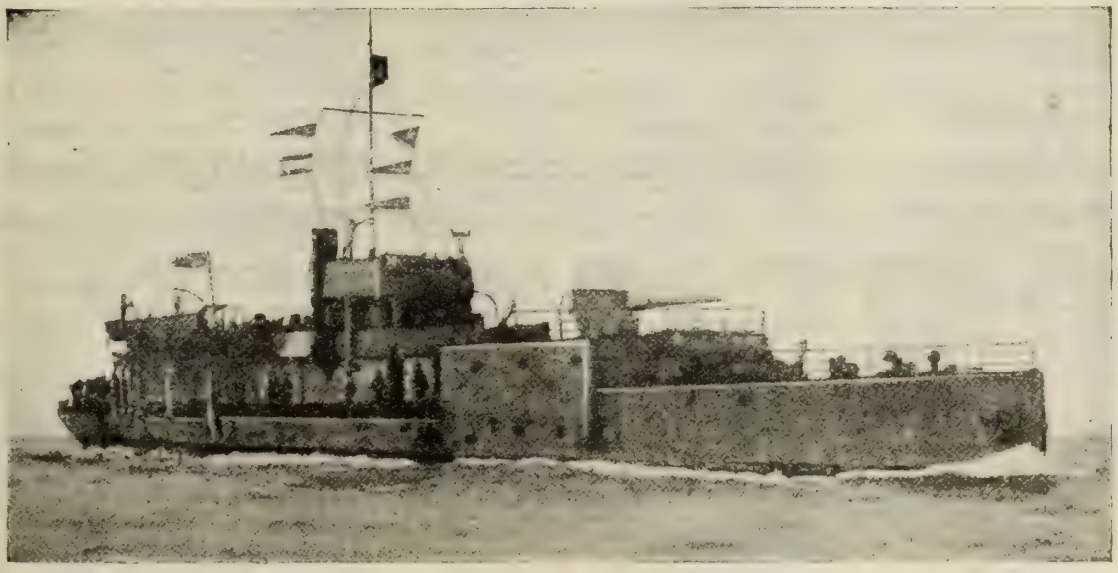
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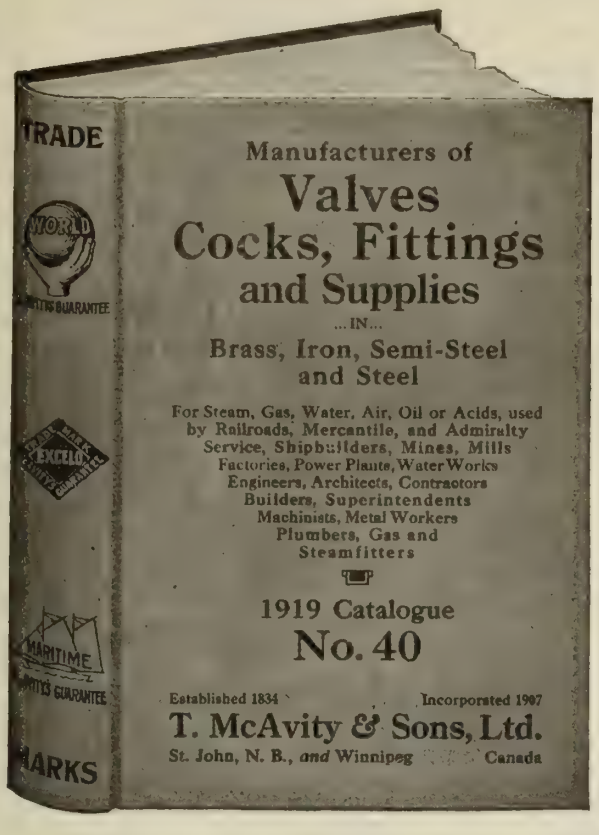
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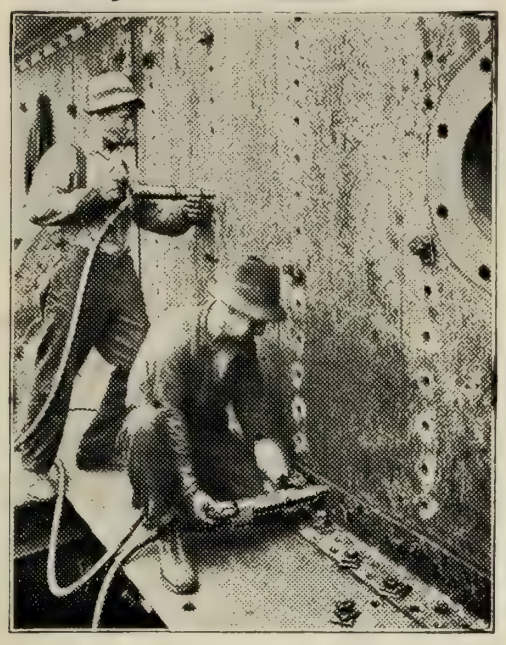
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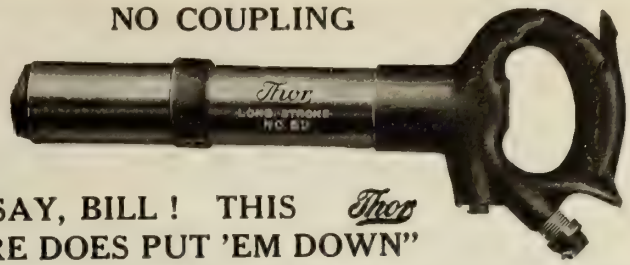
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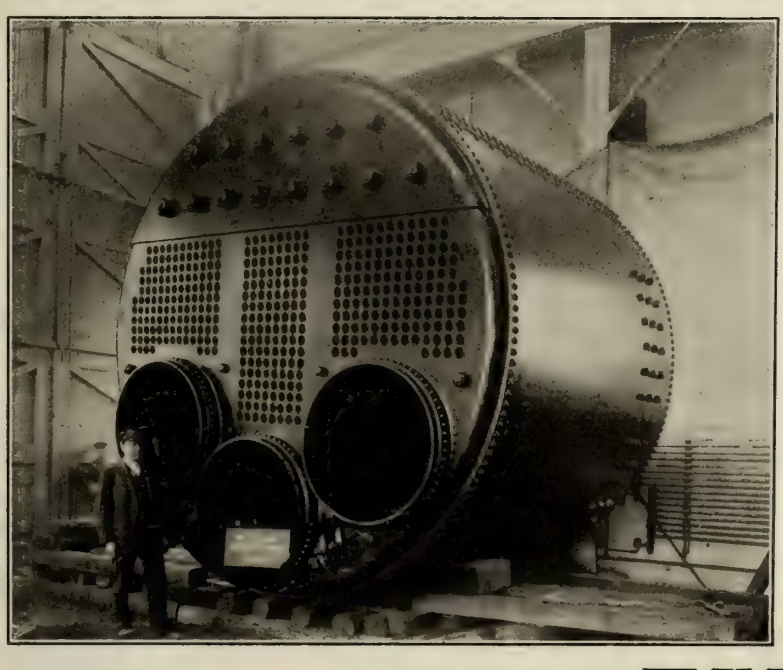
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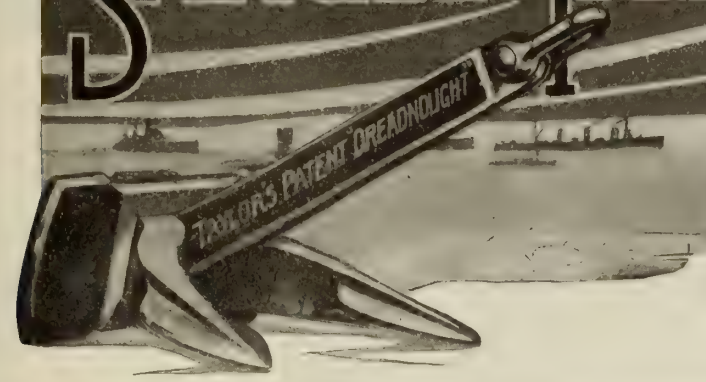
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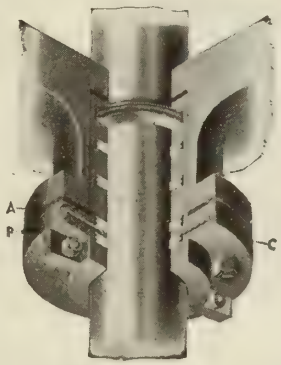
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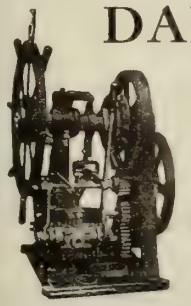
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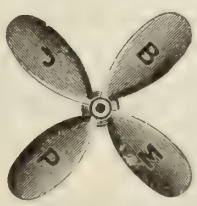
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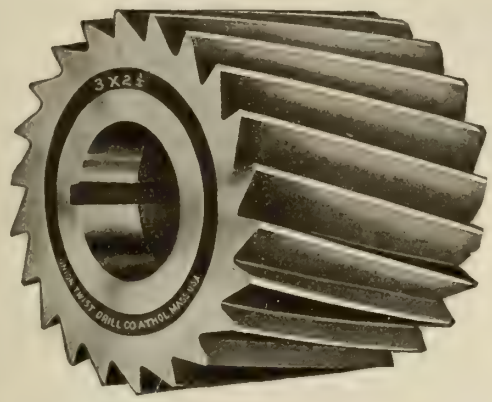
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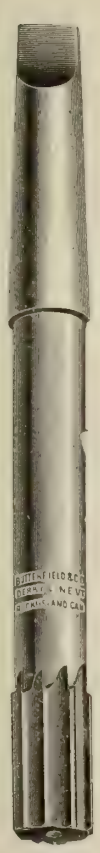
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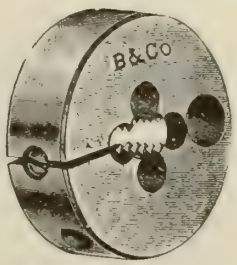


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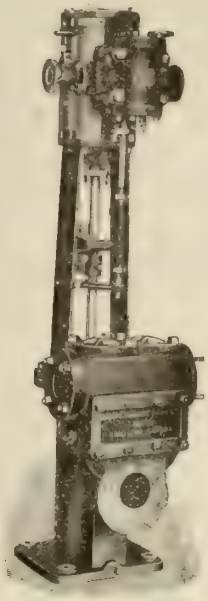


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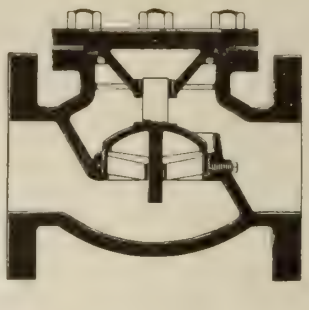
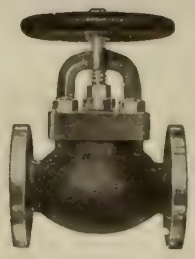
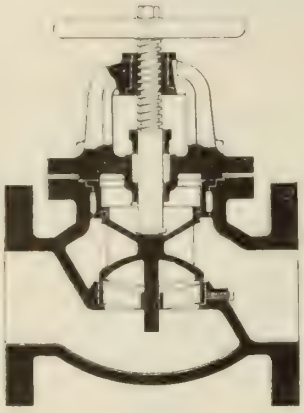
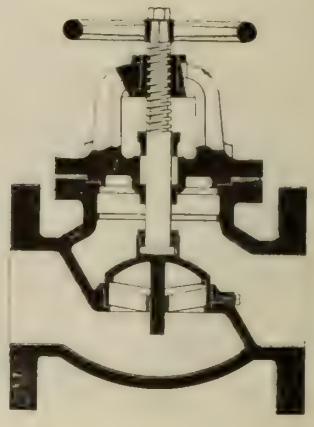


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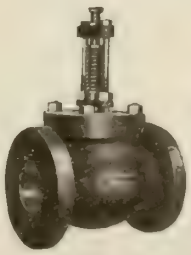



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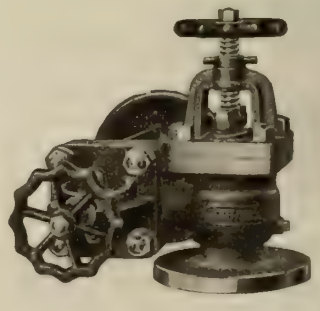
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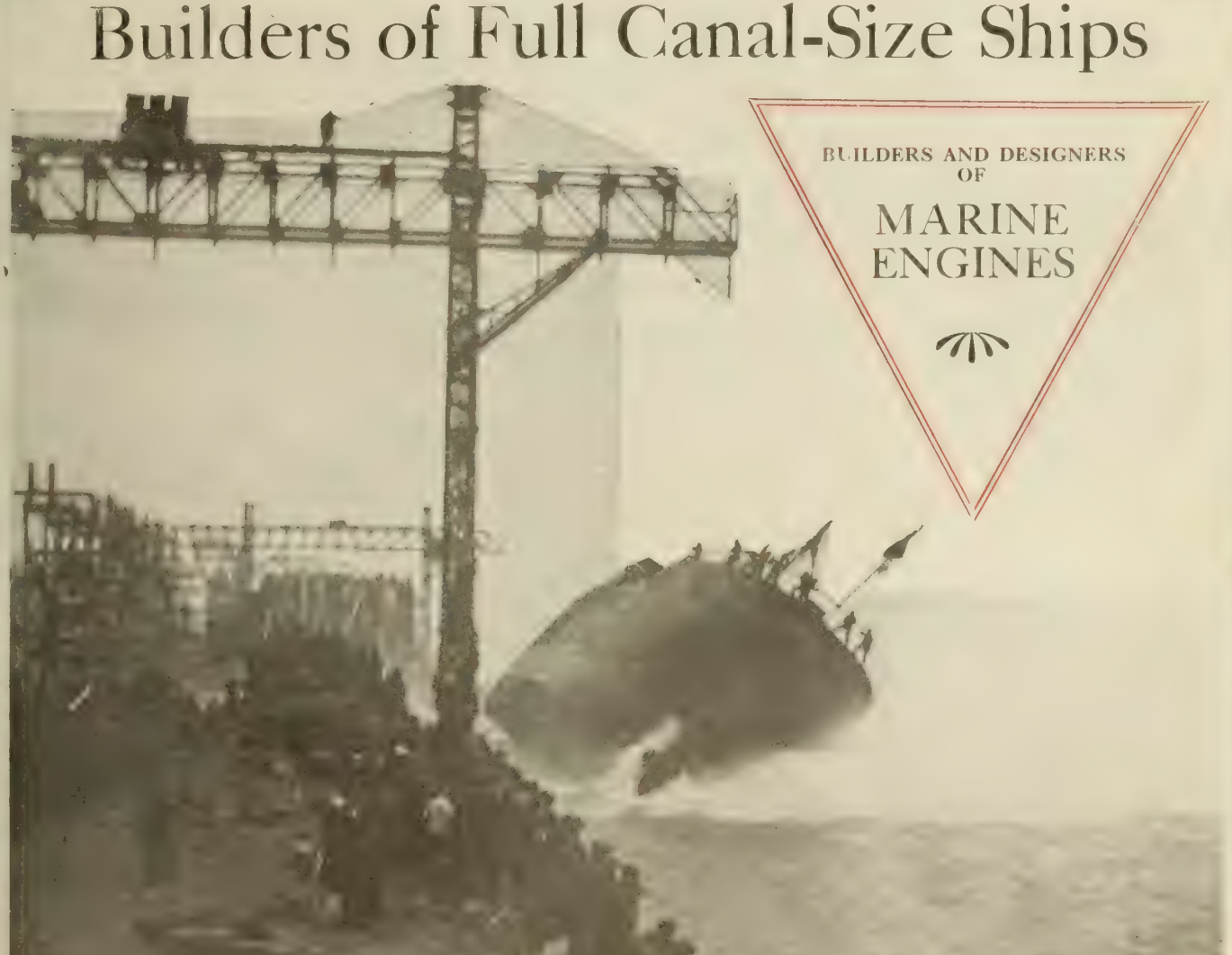
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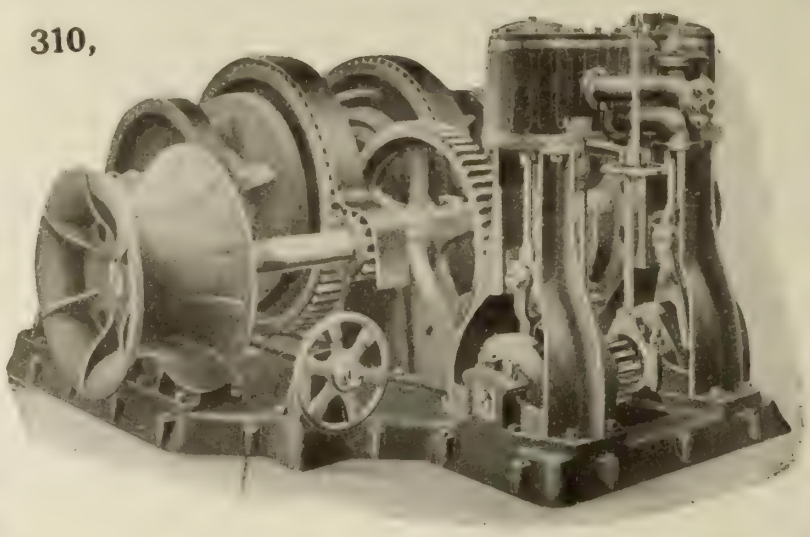
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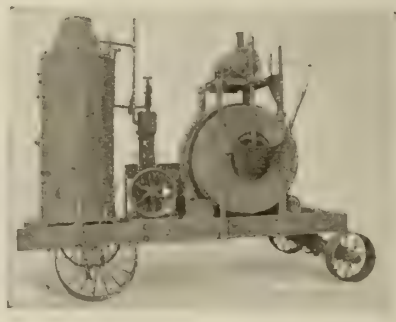
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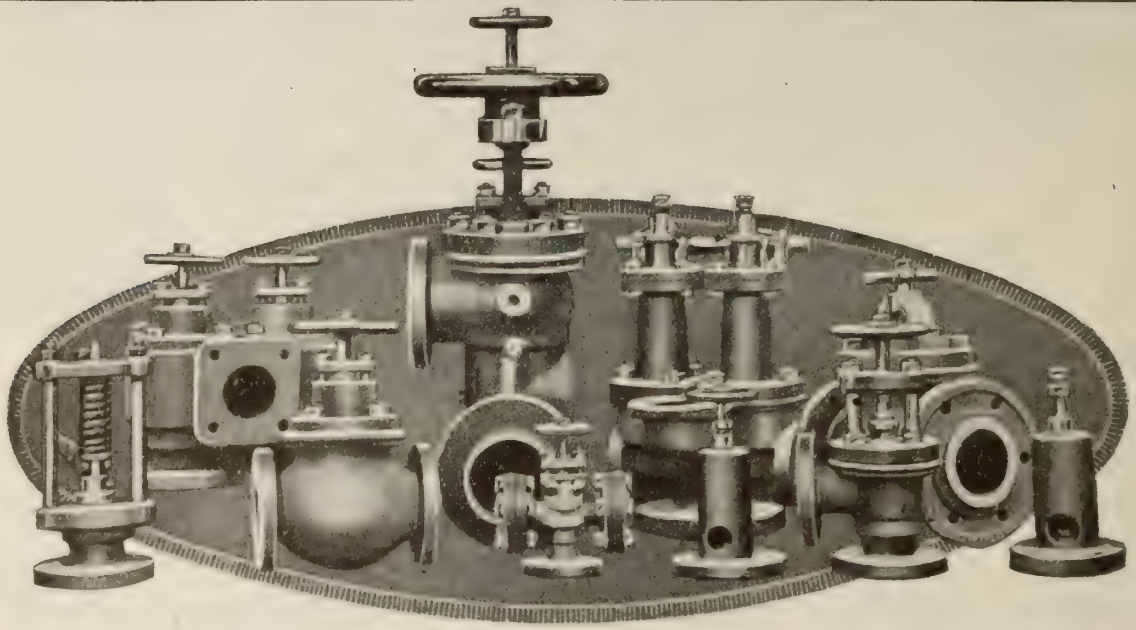
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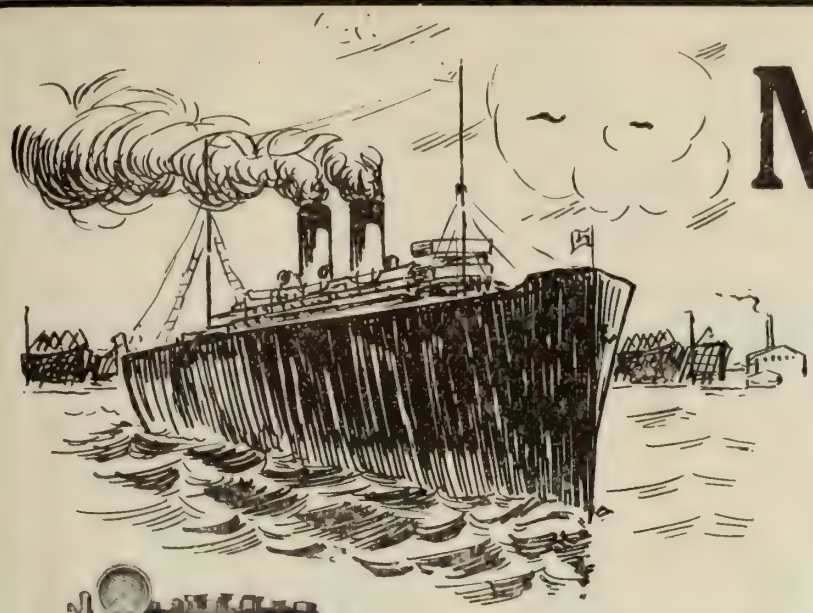
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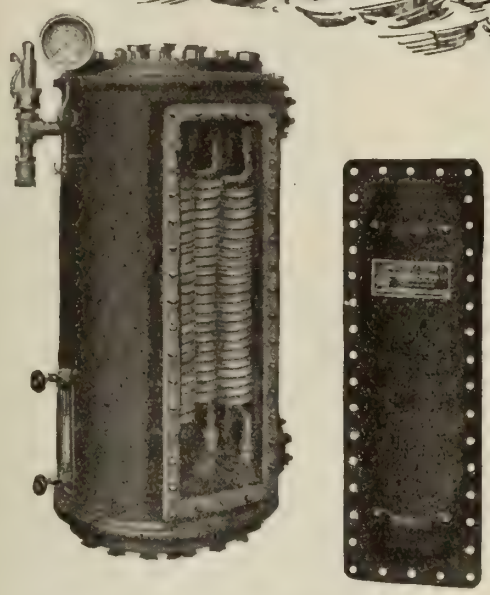
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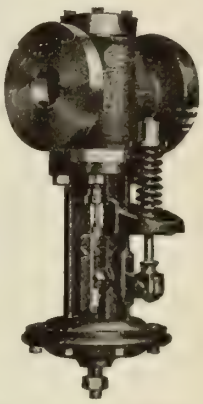
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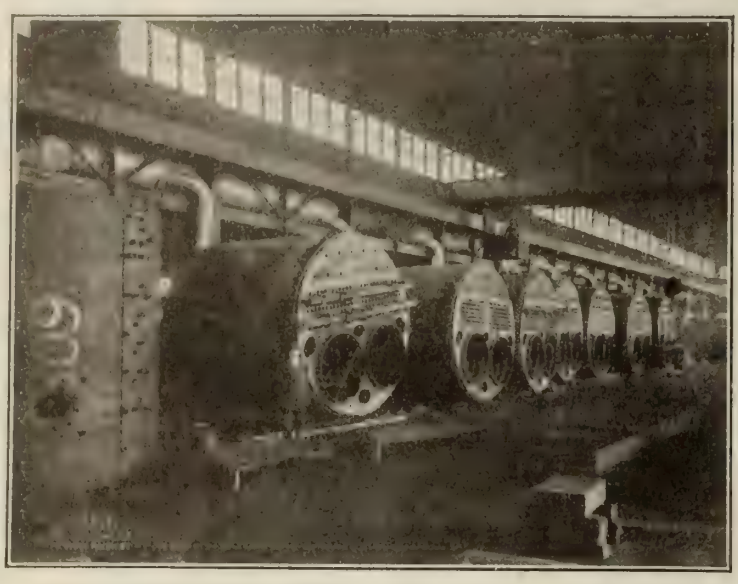
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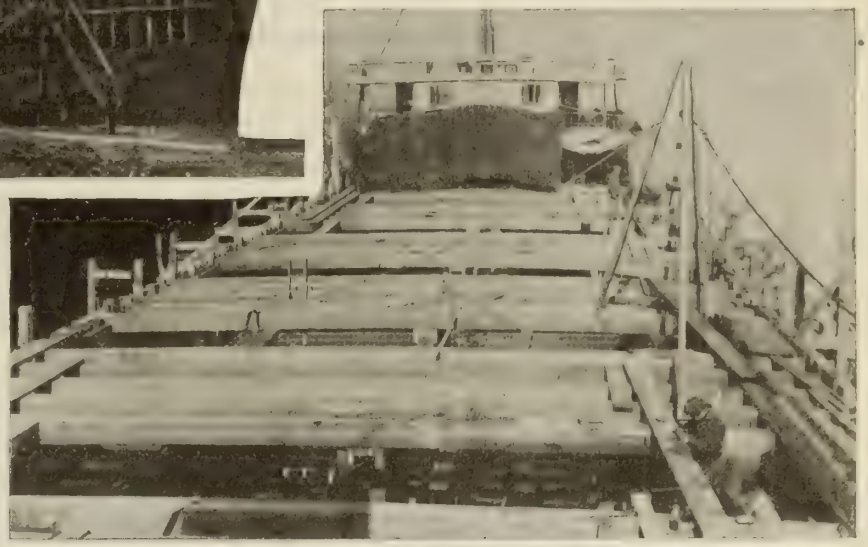
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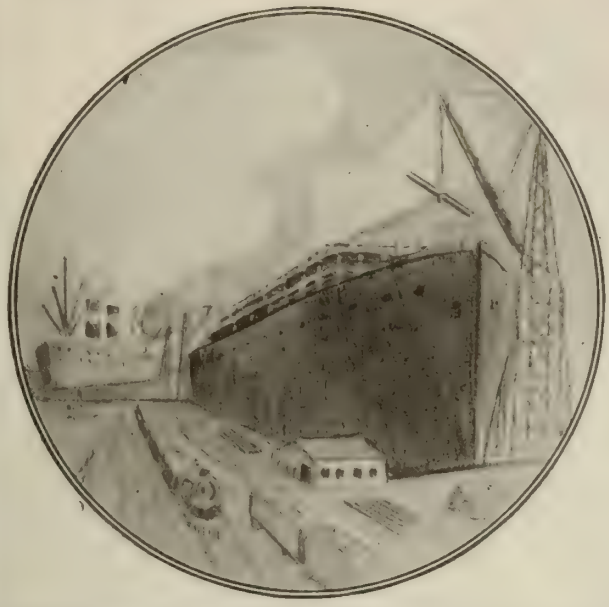
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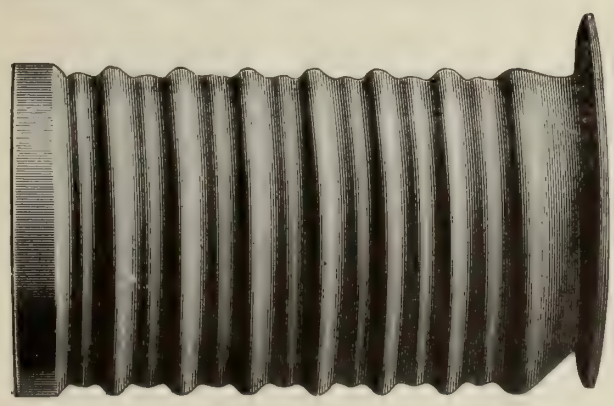
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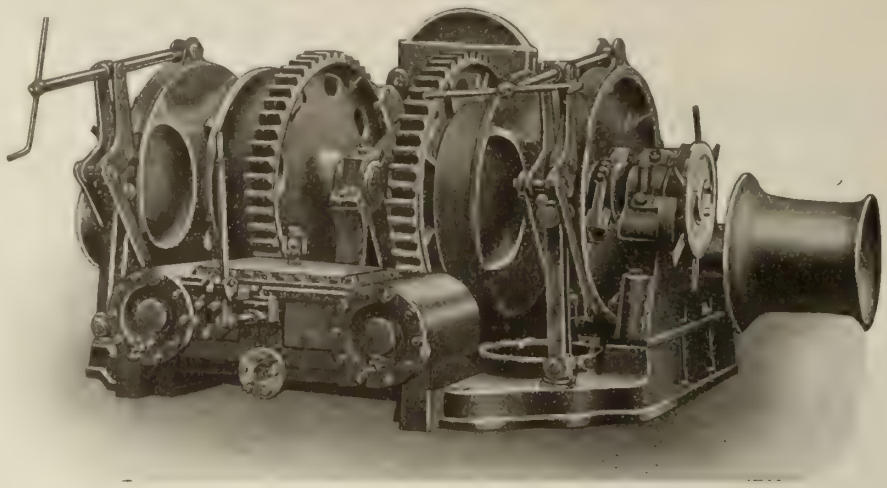
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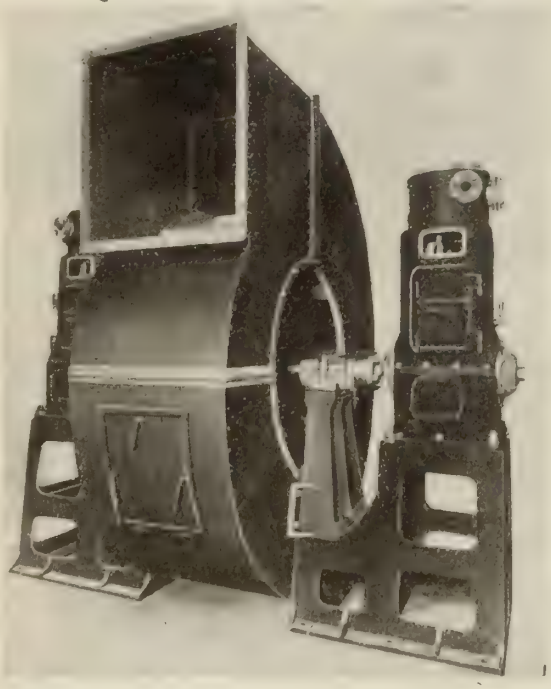


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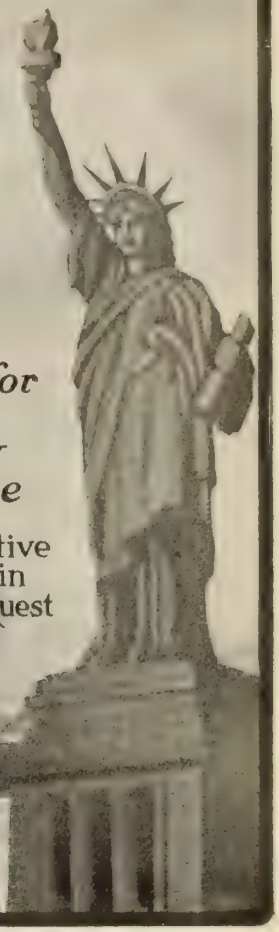
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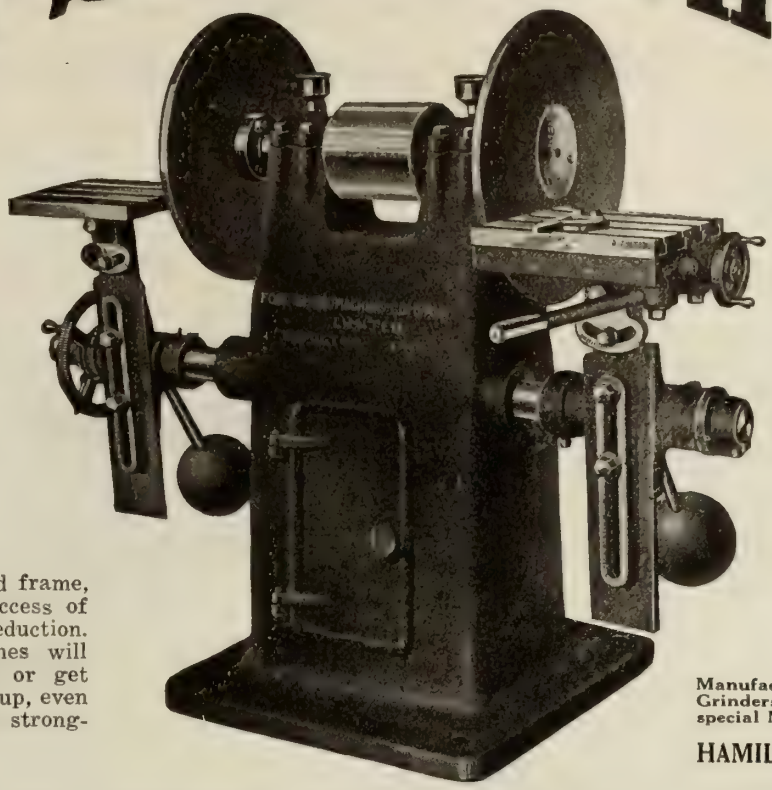
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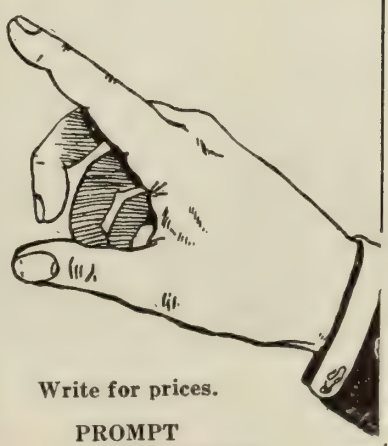
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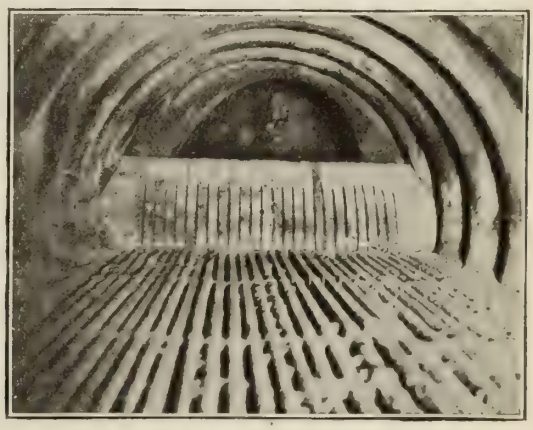


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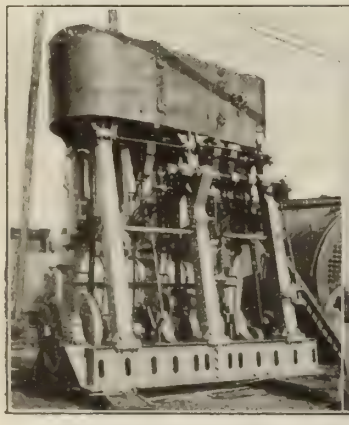
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Breadth Moulded 52 ft.

Depth Moulded 28 ft. 9 in.

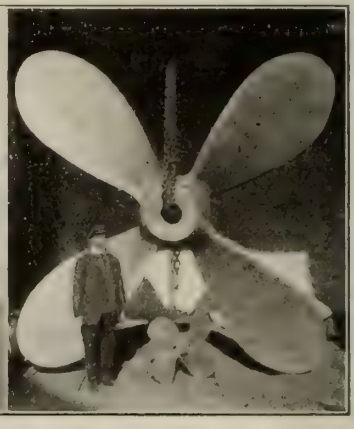
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MARINE ENGINEERING
and
Canadian Merchant Service Guild Review

Volume IX. TORONTO, OCTOBER, 1919 Number 10

A Description of the Mitchell Journal Bearing

Experimental Bearing Fitted to the Destroyer "Mackay," of the British Navy. This Vessel Develops 40,000 S.H.P. and the Installation Was Made by Cammell, Laird & Co., Birkenhead

Courtesy of "Engineer."

WHAT may be conveniently described as the Mitchell principle for bearing surfaces has up to the present been chiefly of interest to the marine engineer, for it has been employed mainly for the thrust blocks of marine engines, no less than 10,000,000 h.p. being transmitted through Mitchell thrusts in the British Navy alone. But now the principle is being developed for journal bearings, and we are fortunate enough to be able, though the courtesy of Cammell, Laird and Co., to place before our readers some particulars of an experimental bearing fitted to the port turbine of H. M. destroyer Mackay, a vessel of 40,000 total shaft horse-power.

Needless to say, this application was not made without a great deal of preliminary experiment. Cammell Laird and Co. submitted a 12-in. journal bearing to a long series of shop tests up to, and even beyond, a pressure of 1,000 lbs. per square inch, with perfectly satisfactory results, full particulars of which were given in a paper read by Mr. J. Hamilton Gibson before the Liverpool Engineering Society in April, 1917. These tests showed that the theory postulated by Mr. Michell in connection with the thrust bearing equally holds good with the journal bearing, and it was the successful result of these tests which induced the Engineer-in-Chief of the Admiralty to agree to one set of the turbines of the Mackay being fitted with the Mitchell bearing, so that a direct comparison might be made with the ordinary type of bearing fitted on the starboard engine.

The construction of the bearing is shown in Fig. 1, where it will be seen that a series of six tipping pads is arranged in a steel shell in the bearing, the pivoting pin of the thrust bearing being eliminated and the tilting being permitted by the reduced curvature of the back of the pad. The oil enters by the central belt and flows out at the side and back into the well at the bottom of the bearing. The total projected area of white metal of the low-pressure Mitchell bearing is only 20,649 square inches, as compared with 94.5 square inches of the ordinary type of bearing fitted on the starboard engine for the same load of 13,328 lb., while the pressures on the bearings are 549 lb. per square inch and 120 lb. per square inch respectively. The comparative sizes of the two types are shown in the reproduction of photographs of the actual bearings in Fig. 2, which shows both the high and low-pressure bearings. The shell is of the same length as the brass of the ordinary bearing, but the part not occupied by the pads is a clearing fit on the shaft, and would, of course, be dispensed with in an entirely new design. The length of the bearing surface is only 3¾ in., as against 10½ in. of the ordinary type which is of the greatest value in large turbines where a certain amount of deflection in the turbine shaft has to be provided for, so that the shorter the bearing can be made without any sacrifice in effectiveness, the less the likelihood of heating. An indication of this fact was given during the two days' progressive trials of the Mackay, for the oil came away from the Michell bearing some 18 deg. cooler than that from the ordinary type. An additional advantage is the shortening of the engine which, including the thrust block, it is claimed, may amount to as much as 20 per cent.—a feature of particular value in present-day warships where such huge powers have to be crowded in. Another very interesting application is the use of the tipping pads to carry the weight of the thrust collar and shaft, the outer surface of the periphery of the single thrust collar being used as a journal.

There is, of course, a difference between the conditions when a pad is used for a journal and when used for thrust, as the same pad has to do for both ahead and astern running in the former case. It is found, however, that as the amount

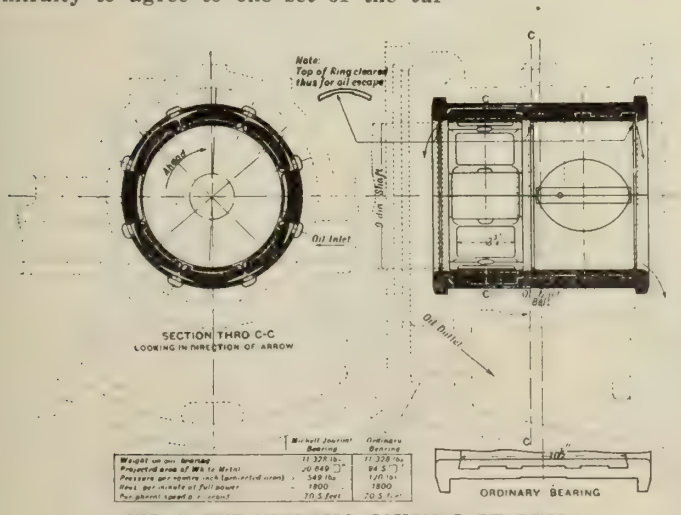


FIG. 1—THE MITCHELL JOURNAL BEARING.

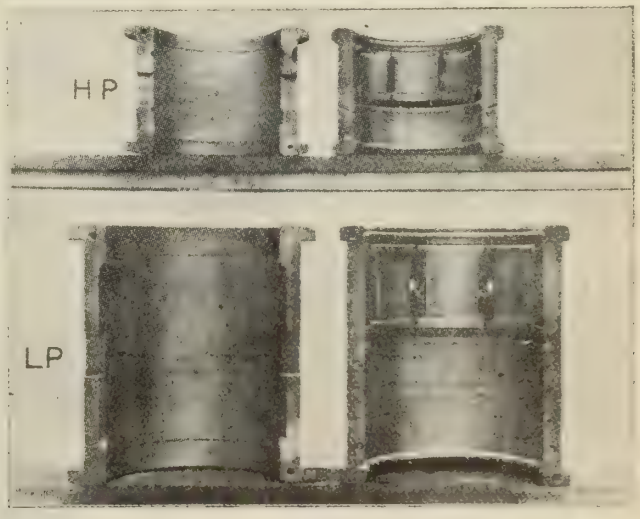
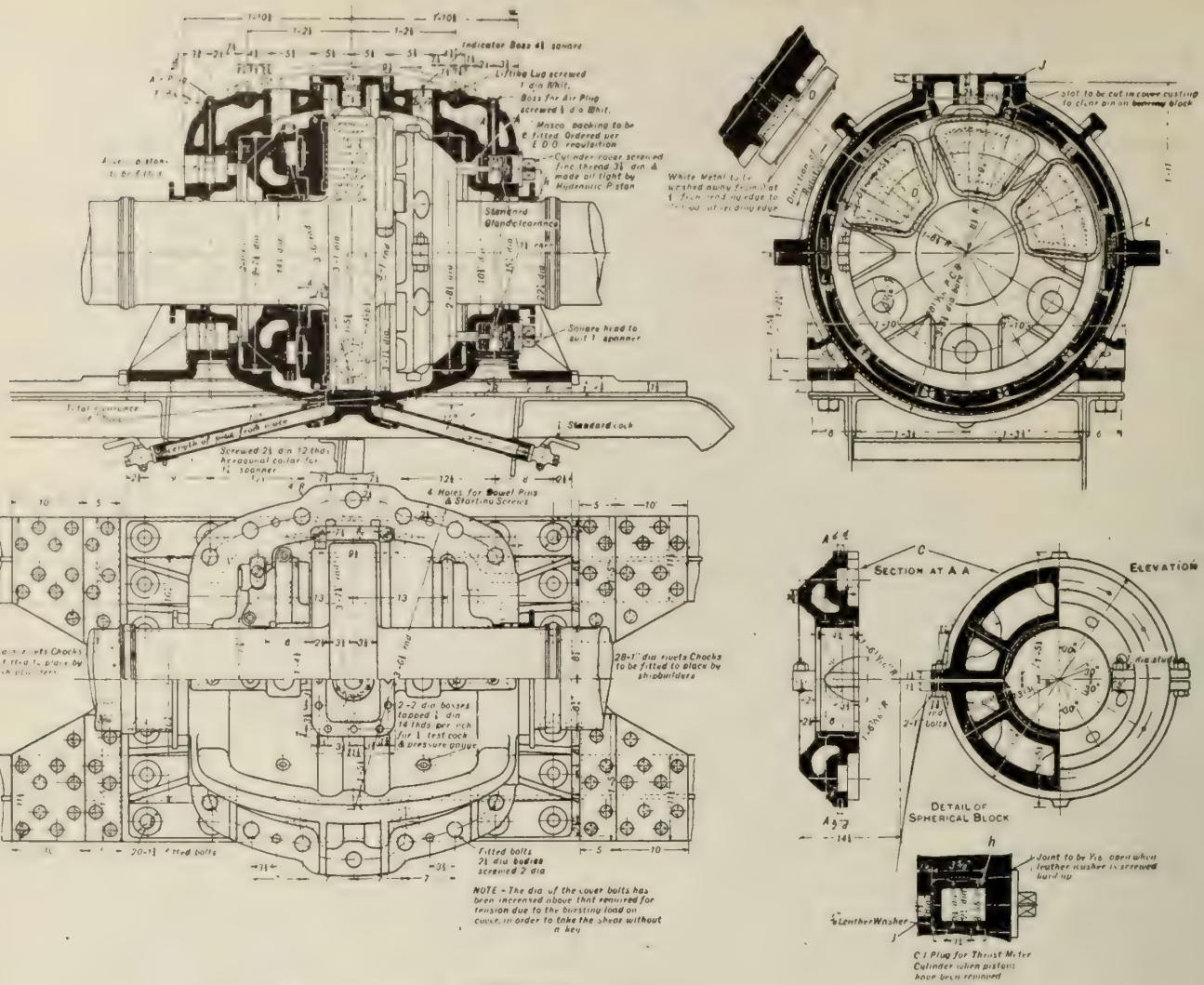


FIG. 2—COMPARISON BETWEEN ORDINARY AND MITCHELL BEARINGS.

MITCHELL JOURNAL AND THRUST BLOCK.



MARK	NAME OF PART
A	Casing Top Half
B	.. Bottom Half
C	Spherical Block (In halves)
D	Thrust Pads
E	Socket Ring (In halves)
F	Check Plate (For Sphere Block)
G	Thrust Pivots for Pads
H	.. .. for Spherical Blocks
J	Cover for Top Half
K	Gland (In halves)
L	Stops for Bearing Pads
M	Overflow Cup
N	Cover for ..
P	Perforated Plate for Cup
Q	Keys for Checks Port Side
R	.. .. .. Starb'd ..
T	Bearing Blocks
V	½ Test Cock
W	Dowel Pins
X	Plungers for Thrust Indicator
Y	Cup Pistons for Plunger
Z	Washers .. ..
a	.. .. ..
b	Cup Pistons for Cylinder Plugs
c	Washers .. .. ..
d	Special Bolts .. .. ..
e	Cylinder Plugs
f	Screws, Bolts, Nuts, Studs etc
g	Liner (In halves)
h	C I Plugs for Cylinder
j	Lrg. Leather Washers
k	Neck Bush (In halves)

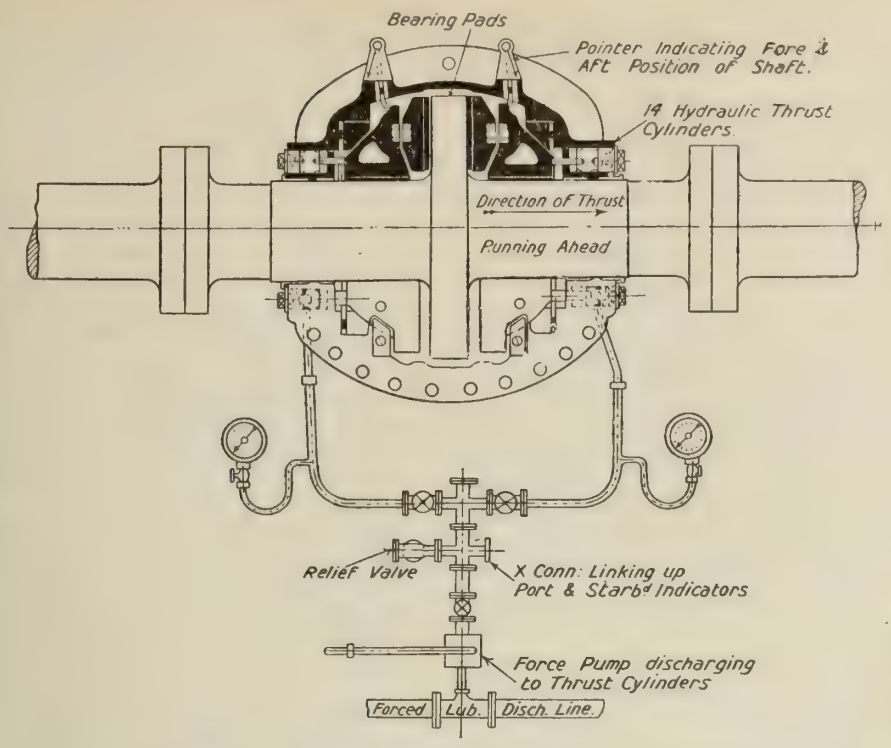


FIG. 3—ARRANGEMENT OF THRUST INDICATING APPARATUS.

of astern running is small, it is quite satisfactory to arrange the position of the pivoting point for maximum efficiency for ahead going and leave the astern going to take care of itself. On the trials of the Mackay, this combined journal and thrust bearing remained so cool that at full power the casing was covered with condensation from the engine-room atmosphere, and the oil temperature never rose above 95 deg.

Yet another point of great interest and value has been introduced by Cammell Laird and Co. in the form of a thrust-indicating apparatus, consisting of a series of small cylinders, interconnected with each other and spaced equally round the thrust casing, carrying rams which project inwards, so as to bear upon the abutment ring which carries the thrust tipping pads. When oil is pumped by hand to these cylinders pressure rises till it is sufficient to force the abutment ring off its metallic seat, and so that it bears the whole of the propeller thrust. A total fore and aft movement of 1/16 in. is allowed for this purpose. As soon as the thrust is borne on the rams, the pressure can, of course, rise no further, and the pumping is stopped. The arrangement of the pipes and cylinders is shown diagrammatically in Fig. 3, and it will readily be appreciated that the pressure necessary to support the thrust as shown on the gauge is an exact measure of the total thrust when taken with the number and area of the rams, and the gauges can, in fact, be calibrated to read the load direct. Any slight leakage can be made by a few strokes of the pump, while the arrangement of cocks makes it quite easy to take a reading for either the ahead or the astern side of the collar. The thrust block itself, with the journal, the thrust and journal pad pieces and the thrust indicating rams in the cover are shown in Fig. 5.

On the trials of the Mackay, the loads registered were 59 and 56 tons respective-

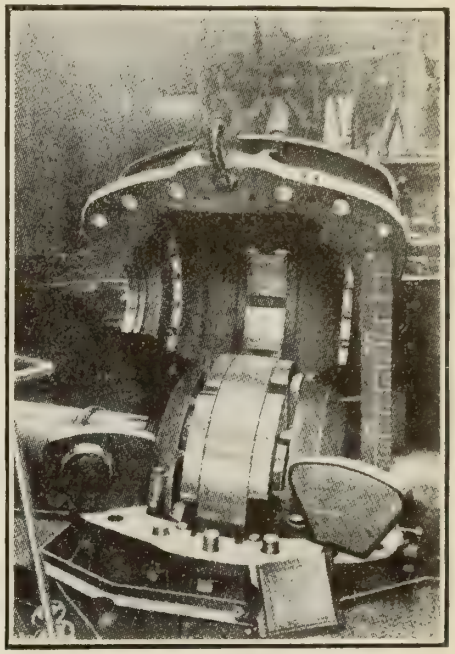


FIG. 5.—MITCHELL JOURNAL AND THRUST BLOCK.

ly for the port and starboard engines, and these loads varied at the end of the mile to 61 and 47 tons when turning, reverting to the former figures when on the straight again. Variations in speed were also registered on the gauge, and are reproduced as a chart in Fig. 4, and make a perfectly fair curve. This method of recording thrusts should be of the utmost value in deciding questions of propeller efficiency, etc., and the chart clearly shows the commencement of cavitation where the curve falls away at about 430 revolutions per minute.

We had the opportunity of examining the surfaces of the thrust and journal pad pieces when the engines were stripped after the conclusion of the trials, and were very much impressed by the entire absence of any sign of metallic contact indicated by their condition.

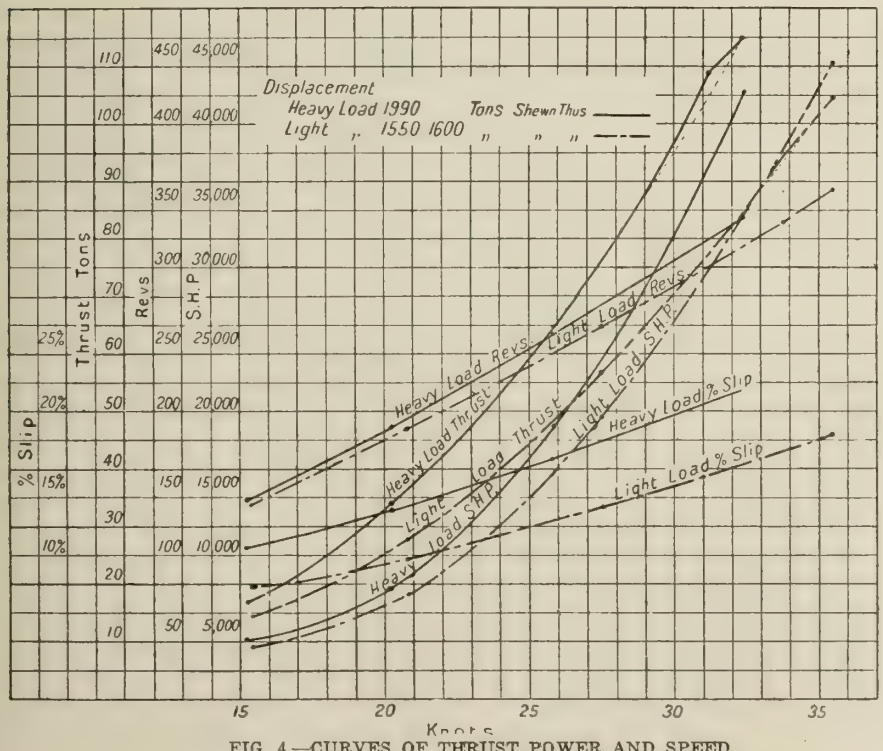


FIG. 4.—CURVES OF THRUST POWER AND SPEED.

SCOTCH MARINE BOILERS VS. HEINE WATER TUBE MARINE BOILERS

An interesting comparison between the old Scotch Marine Boiler and the Heine Water Tube Marine Boiler has recently been written by Chas. H. Stoddard, Consulting Marine Engineer for the Heine Safety Boiler Company, St. Louis, Mo.

Herewith are compared two boilers of approximately the same capacity. One is a Scotch Marine Boiler, 14 ft. 9 in. in diameter, containing 2,700 square ft. of heating surface and built for 210 lbs. working pressure. The other is a Heine Marine Water Tube Boiler, also containing 2,700 square ft. of heating surface, and built for a working pressure of 225 lb. per square in

The Scotch Boiler is fitted with 3-in. tubes, and the Heine Boiler with 3½-in. tubes. Both are suitable for either coal or oil fuel but are here considered as fitted for oil burners.

To the weights given for the Scotch Boiler, must be added seven tons to cover the difference in weight of breechings, fire fronts, boiler mountings, lagging, retarders, etc., which are either included in the weights given for the Heine Marine Boiler or are unnecessary.

Cargo steamers, such as have been recently built for the Emergency Fleet Corporation, are each equipped with three boilers. The weights involved are therefore 253½ tons for the Scotch Boiler installation against 162 tons for the Heine Water Tube installation—a saving in fire-room weight by the use of Heine Marine Boilers of 91½ tons. An actual possible increase of paying cargo capacity of approximately one hundred tons should be of interest to any steamship owner.

Some water tube boilers are even lighter than the Heine Boiler. It is stated by the Heine Safety Boiler Co., that they also could make the Heine Boiler lighter if extreme light weight were believed advisable. However, that argument has no place in this article.

The Scotch Boiler is held in esteem by many engineers because of the large volume of water it contains ready to turn into steam the instant a greater demand for steam is made upon it. This is a reservoir of power that tends to reduce fluctuations of pressure in operation.

The manufacturers of the Heine Boiler recognize the value of this "reservoir of power." They do not approve boilers of the "ultra light weight" type, therefore they fit their boilers with water legs eleven inches deep instead of 5 in. or 6 in. These water legs have not been stinted either in height or width, nor are they broken up into numerous "headers," nor is their capacity reduced by partitions and obstructions. The capacious water legs are stayed with screwed stay-bolts from which, within the water space, the screw threads have been carefully removed.

As for comparative cost—one has but to look at the designs. Note the 1 9/16-in. and 1¼-in. plates, the great weight of high priced steel, and the many costly flanged heads used in the construction of the Scotch Boiler, and note that the few plates used in the water tube boiler for higher working pressure are but ½-in. and ⅝-in. thick. After one notes these points he realizes why the cost of the Scotch installation exceeds often by as much as 50 per cent. the cost of a water tube installation.

THE ROYAL MAIL STEAM PACKET COMPANY

On Sept. 26, 1839, a Royal Charter was granted by Queen Victoria in the third year of her reign to the Royal Mail Steam Packet Company, which had been formed for the purpose of providing a mail and passenger service between "Great Britain, the West Indies, North and South America, and such other foreign parts as the public service may require." The ships of the company—for a long time past familiarly known as the "R.M.S.P."—have kept up their connection with the West Indies ever since, in addition to serving Peninsular, South American, Moroccan and Eastern ports.

It is remarkable how times have changed since the formation of the company. Its first vessels were paddle craft of about 1,800 tons, with a speed of about 8 knots, and in those days the satisfactory victualling of passengers must have been a great difficulty, especially in the tropics, as refrigerating machinery was unknown, and live sheep and fowls had to be carried to ensure a supply of fresh meat, while dim oil lamps were a poor substitute for the modern electric light.

The journey from the metropolis to Southampton for embarkation had also at that time to be made by road, as the first railway communication was not established until the following years—1840—when the London terminus was at Nine Elms. Waterloo Station was not opened until 1848, and Southampton Docks were non-existent.

The history of the company from many points of view is interesting to follow, affording as it does instance after instance of the development of trade routes to the benefit of British commerce in nearly all parts of the world, carried on by the company's own ships and those of its associated lines.

The Panama Canal is one of the modern wonders of the world, but the company organized transit by mules and canoes across the Isthmus as far back as 1846, and partially financed the Panama Railway Company in 1850.

Throughout its long history the company has provided steamers which have been of good service in war as well as in peace. The Coldstream Guards were taken in 1854 from Southampton to the Crimea in the Orinoco, and the Trent took the Royal Welsh Fusiliers to Constantinople. In the following year the Medway took the Royal Artillery for Balaclava. In 1861 the Confederate Commissioners—Mr. Slidell and Mr. Mason—were taken from the Trent by the Federal warship San Jacinto, and in connection with this incident, which nearly caused a rupture between England and America, the Magdalena and Parana carried troops to Halifax. In 1900 six of the company's vessels carried troops from Southampton to South Africa to take part in the Boer War; while, as regards the Great War just terminated, practically the whole of the company's fleet has been on war service, either as armed cruisers, hospital ships or carriers of food and munitions, among its famous modern vessels being the hospital ship Asturias, torpedoed in the English Channel, and the Alcantara, armed cruiser, which sank the German raider Greif in the North Sea on Feb. 29, 1916.

It is interesting to note that on the eighth anniversary of the Royal Mail Steam Packet Company's foundation, the first ship to resume the South American service after the war is sailing from Southampton.

SILVER MEDAL FOR SAVING LIFE AT SEA

His Majesty the King, on the recommendation of the president of the Board of Trade, has been pleased to confer the Silver Medal for Gallantry in Saving Life at Sea on Mr. John McQuarrie, lately second engineer of the steamer Clan Ross, of Glasgow.

On May 5, 1918, the Clan Ross was torpedoed in the Mediterranean Sea. The engine-room and stokehold became rapidly flooded with water and steam, and nine men who were on watch were instantly killed.

Mr. McQuarrie, who was one of those on watch, managed to pull himself up while he was being washed through the engine-room, and then, without any thought of securing his own safety, he proceeded to stop the engines by shutting the main engine stop valve. The way was thus taken off the ship, and this enabled the boats to be launched without accident, and probably was the cause of the remaining members of the crew being saved.

A CHEMICAL ELEMENT

At the recent annual meeting of the Association of British Chemical Manufacturers it was announced that a friendly understanding had been come to between the British and French chemical industries for co-operation in international development. The British association now represents £70,000,000 of capital invested, and continued rapid growth in the department of dyestuffs and fine chemicals is assured. The importance of chemical progress in its relation to industrial efficiency and the life of a nation cannot be overestimated, and everything possible will be done to hold and extend the amazing advance made in Great Britain in response to the necessity for sudden development during wartime.

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

THE effect of the application of heat to a body, whether a solid or fluid, or a gas, is to agitate the molecules composing the body and increase their vibrations. They thus tend to occupy more space, which causes the whole body to expand, and this expansion may be linear or volumetric. Similarly, with one or two notable exceptions, subtraction of heat causes a contraction of the body acted upon and this expansion and contraction is a very important item to the engineer.

The most notable exception to the rule of contraction during cooling is the case of water at 39° Fahr., water is at its maximum density, and addition or subtraction of heat above or below that point causes it to expand. This accounts for the terrific force exerted by water freezing in a confined space, such as a cylinder or pipe, the force exerted by the molecules of the water in expanding being sufficient to break the strongest container man can devise.

Expansion Through Heat

In the case of water expansion takes place with addition of heat until a point is reached, according to the pressure it is subjected to, where it changes its state and becomes a gas. Iron or steel or any metal expands with heat, the molecules becoming less homogenous, or we may say, more widely separated, the earlier evidences of this being the softening of the metal. This enables it to be worked easily, being in a more or less plastic state. Carry on the heating process further, the molecules become entirely separated and the metal becomes fluid and can be poured, like water. It changes its state. Gases under the influence of heat retain their state, but increase their volume very rapidly unless prevented by being confined. In that case they increase in pressure. Solids expand less rapidly than liquids, while liquids in turn expand less rapidly than gases.

Expansion through heat may take place in either of three ways, linear, surface or by volume. Of course, the latter includes the other two. Linear expansion is half the surface expansion, and one-third the cubical expansion. There is a definite amount of expansion per degree temperature to all substances. This is known as the co-efficient of expansion. For instance, the co-officient of expansion of wrought iron is .000006, which means that for each degree Fahr. added, the material will stretch that part of its length. Suppose we have a bar 24 inches long at a temperature of 40°, and it is heated to 80°. The heat added is 40°. The co-efficient for one degree multiplied by 40 gives the co-efficient for 40 degrees. That is $.000006 \times 40 = .00024$. Now this is the fraction of the original length that is added, so we have $.00024 \times 24 = .00576$. This added to the original length gives 24.00576 as the new length. This is true, whether feet, inches, or miles are used as units. A handy rule is when an increase of temperature takes place in a bar to find the new length L, the original length being l, and the increase of temperature t°, and co-efficient of expansion C. $L = l(1+ct°)$. If the bar is acted on by a decrease of temperature, shortening from L to l, then $l = \frac{L}{1+ct}$

The co-efficients of linear, surface, and volumetric expansion of solids, liquids, and gases, are to be found in tabulated form in most engineering handbooks. Some of the more important metals have the following co-efficients: Wrought iron and steel, .0000065; cast iron, .0000055; brass, .00001. The expansion of steam pipe lines, boiler plates, steel rails, steel bridges, is something which comes under the notice of every engineer daily, and which he must take precautions against in designing and erecting. In some cases this property of expansion and contraction of metals becomes a valuable aid to the engineer, as for instance, in securing crank webs to crank shafts, fly wheels to shafts, and liners to shafts.

Specific Heat

While the subject of specific heat may be followed back to highly scientific investigations, it is not necessary for the engineer who is dealing with practical problems only to go into such refinements. Specific heat, like specific gravity, is used to enable us to compare the various materials to a standard base. Water is the standard for specific gravity, which is to say that 1 cubic foot of water at its greatest density, 39.2°, has a weight of 62.425 lbs., usually written 62.5. One cubic foot of cast iron weighs 450 lbs., and, compared to a cubic foot of water, is 7.2 times as heavy, therefore we say its specific gravity is 7.2. One cubic foot of charcoal weighs 27½ lbs., and its specific gravity is .441.

In considering specific heat, we may call it capacity for heat of different bodies. Take again water as a standard, but in this case water at atmospheric pressure and at 62° Fahrenheit. This temperature is taken because the B.t.u. is calculated on the amount of heat required to raise one pound of water one degree from 62° to 63°. Now if we want to raise the temperature of a bar of iron, a column of mercury, or a cylinder full of air, it is obvious that they will not each require the same amount of heat. If the bar of iron weighs five pounds and we want to raise its temperature 5 degrees, the amount of heat we must put into it will compare to the amount of heat necessary to raise a like weight of water the same amount, as its specific heat does to 1. The specific heat of iron is .1138. Then we have

$$.1138:1::X:5 = .569$$

As the reader may easily see, the heat required to raise any substance any amount may be found by multiplying its weight by its specific heat and the number of degrees to be raised. For instance, supposing we want to raise 100 pounds of iron 100 degrees in temperature, what number of B.t.u.'s would we need?

$$100 \times 100 \times .1138 = 1138 \text{ B.t.u.}$$

The specific heat of water above or below 62° varies from the standard, and this is taken into account in the compilation of steam tables. For instance, water at 212° Fahr. and atmospheric pressure is, according to the scale, just 180° above 32°, and would therefore require for one pound 180 B.t.u. However, the heat required is actually 180.531, thus showing that the specific heat is slightly greater than at 62° Fahr. As both temperature and pressure increase, the specific heat rises. Water at a pressure of 300 lbs. per square inch absolute has a temperature of 417.371°. That is, it is 385.371° above 32°, which is the point always measured from. The quantity of heat required is, however, 390.933, a difference of 5.562 B.t.u. per pound. The temperature of the steam at this pressure is of course the same as the water it is made from. When steam is heated above the temperature corresponding to the pressure, it is said to be superheated, and in this state its specific heat is less than that of water.

As an example of the application of specific heat to practical problems, take the case of different substances at different temperatures mixed together, and it is required to know what the final temperature will be. The most familiar instance, of course, would be that of steam and water. Suppose we have ten pounds of water at 62°, and we mix with it 5 pounds of steam at 100 lbs. pressure, what would be the temperature of the resulting mixture?

We have

t = temperature of mixture.
t_1 = temperature of water.
t = temperature of steam.
w_1 = weight of water.
w = weight of steam.
s = specific heat of water.
s = specific heat of steam.

Then $t =$

$$\frac{w_1 s_1 t_1 + w_2 s_2 t_2}{w_1 s_1 + w_2 s_2}$$

$$\frac{10 \times 1 \times 62 + 5 \times 1.0077 \times 316.893}{10 \times 1 + 5 \times 1.0077}$$

which, worked out, gives 147.4° as the result of the mixture.

Again, suppose we had 100 lbs. lead, 75 lbs. zinc, and 25 lbs. tin, at the melting point and mixed them together, we would get

$$t = \frac{w_1 s_1 t_1 + w_2 s_2 t_2 + w_3 s_3 t_3}{w_1 s_1 + w_2 s_2 + w_3 s_3}$$

$$= \frac{100 \times .0314 \times 626 + 75 \times .0956 \times 680 + 25 \times .0562 \times 446}{100 \times .0314 + 75 \times .0956 + 25 \times .0562}$$

$= 486.4°$

In considering the effects of adding heat to gases, we must first explain what is meant by absolute zero of temperature. It has been found that if a cubic foot of gas is raised from 32° Fahr. to 212° Fahr. at constant pressure, it expands to 1.366 cubic feet in volume. That is to say, that in adding 180 degrees to the temperature, the volume has been increased .366. Then, for each degree, the volume increases $\frac{.366}{180}$. That is $\frac{.366}{1000} \div 180$, which, worked out, comes to $\frac{1}{491.8}$ or $\frac{1}{492}$ of its volume of 1° temperature. Now this is found to be a uniform addition over the range of temperature taken, and so is assumed to be uniform over any greater range. Supposing instead of the gas being heated it were cooled from 32° downwards. If each degree cooler reduced the volume by $\frac{1}{492}$, when it had been cooled to 492° below zero it would have no volume. Of course this temperature could not be reached actually, as gases liquefy before reaching so low a temperature, but this assumption is made to enable us to have a definite working point to start from. Supposing we reached this point where there was no volume, obviously there could be no temperature. Therefore, the absolute zero of temperature on the Fahrenheit scale is assumed to lie at a point 492° below freezing point, or 460° below zero.

On the Centigrade scale the absolute zero is at 273° below zero. In theoretical studies of heat, it is the absolute temperature that is used, and it is usually denoted by the capital T.

Expansion of Gases

Gases, in being subjected to heat, differ from solids or fluids in that they possess elasticity and are capable of being compressed. That is, if we take a cubic foot of a gas and enclose it in a cylinder having a weightless and frictionless piston, and apply heat to it, the expansion of the gas will raise the piston. If, now, instead of allowing the piston to rise freely we should place weights on it, the gas cannot expand. In this case the addition of heat will result in an increase of pressure instead of an increase of volume.

Now this increase of pressure or volume as the case may be are in direct proportion to the absolute temperature.

This may be stated as follows: If a gas is heated while remaining at constant volume, its pressure will increase directly in proportion to its absolute temperature.

If a gas is heated while remaining at constant pressure its volume will increase directly in proportion to its absolute temperature.

If the gas is cooled the same law applies.

Take a concrete instance as an illustration.

Suppose we have a certain volume of gas at a temperature of 212° Fahr. and it is heated while remaining at constant volume to 250°. Its pressure at 212° is 14.7 lbs. Its absolute temperature is $212 + 460 = 672$. When raised to 250° its absolute temperature is $250 + 460 = 710$. The pressure will be then

$$14.7 \times \frac{710}{672} = 15.5$$

If we have 5 cubic feet at a temperature of 150° and it is raised to 200°, the pressure remaining constant, the volume will be

$$5 \times \frac{200 + 460}{150 + 460} = 5 \times \frac{660}{610} = 5.405 \text{ cu. ft.}$$

Mr. William McIntosh, French River, Ont., is an enthusiastic subscriber. In a recent letter he says: "I would not be without MARINE ENGINEERING OF CANADA at any cost.

* * *

The Chief Engineer of J. Coughlan and Sons, Vancouver, B.C., Mr. Jno. Maitland, writes: ". . . . received your paper regularly. Good reading and material."

* * *

Mr. J. A. McKay, Engineer, Steamer "Bon Ami," Little Current, Ont., says: "I find MARINE ENGINEERING a first class publication and just what is needed in our line."

* * *

MARINE ENGINEERING:

Dear Sirs,

On returning home from France, I find that I am away in arrears with subscriptions, which I wish to pay, also make a fresh start with your valuable paper once more. Please find enclosed $3.00. Yours truly,

JOHN RIDGE,
Pontypool, Ont.

TRADE WITH GERMANY AND OTHER COUNTRIES

A White Paper published yesterday sets forth the conditions under which trading is permissible with certain countries, and notes are given on trading conditions as affected by the raising of the blockade. The White Paper states that it may be expected there will be a considerable demand in the late enemy countries for all kinds of goods, and as this market is now open to all the world, it is no part of the policy of the Government to discourage British traders from competing therein. It is desirable that British traders should make every effort to secure a proper footing in Central Europe.

Any goods may be sent to Germany without license, except goods on lists "A" and "B" of prohibited exports. It is understood that at present the import of all goods into unoccupied Germany is subject to import license, for which the German consignee has to make application to the competent authority in Berlin. Any goods may be imported from Germany and paid for without license, except goods whose importation from all foreign countries is prohibited.

Other transactions of a commercial or financial nature with firms in Germany are permissible without further license, provided they do not involve any of the following matters, namely: (a) the payment of money arising out of pre-war transactions; (b) the delivery of, or dealing with, property held in this country for persons in Germany since before the outbreak of war; (c) the transfer of securities by, or on behalf of, a person in Germany; (d) the allotment or transfer of securities issued by a company to, or for the benefit of, a German subject; (e) the transfer of any debt or other obligation due to a person in Germany.

With regard to the territories previously included in the Austro-Hungarian dominions, the British regulations are the same as those set out in the case of Germany, except that list "D" applies in the case of exports to Austria and Jugo-Slavia. Except also, that list "D" of prohibited exports applies to Turkey, and lists "D" and "E" to Bulgaria, the British regulations are the same for those countries as for Germany.

It is mentioned that it is no longer necessary to obtain certificates from importing associations in Norway, Sweden, Denmark, Holland and Switzerland. Export licenses are required only for goods on lists "A" and "B" of prohibited exports. So far as British regulations are concerned, there are no special restrictions on trade with Finland, Esthonia, Lettland and Lithuania, but as in the case of other foreign countries, export licenses are required for goods on lists "A" and "B," and general prohibitions of imports apply to these as to other countries.

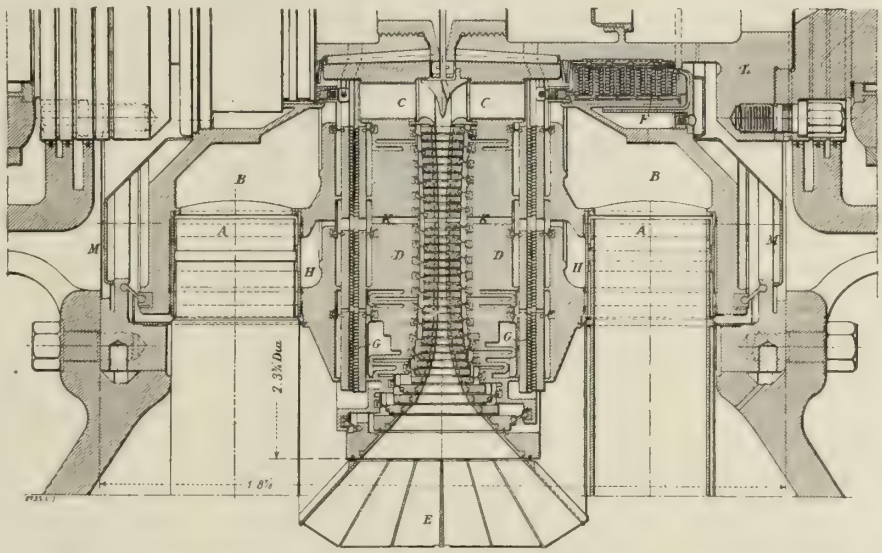
Construction of The Ljungstrom Steam Turbine

This Turbine is Unique in Its Design, Permitting as It Does of a Radial Flow of Steam Through the Blades From the Shaft Outwards

THE accompanying illustrations and drawings show the Ljungstrom Angturbine of Finspong, Sweden. This Swedish steam turbine of the reaction type suffers from certain drawbacks, some of which are shared by impulse machines and others are peculiar to itself.

It is stated that to get high efficiency at practical blade speed involves a very large number of blade rows, and consequently a long and expensive rotor. With a high or rapidly varying superheat, there is always a risk of distortion of the casing, which may result in the stripping of the blades, while the necessary normal temperature gradient down the casing combined with the effect of heavy joint flange and equalizing pipes also brings expansion troubles and the necessity of providing for ample clearances. This limits the possibility of economically utilizing high pressure and high superheated steam. This has led to the adoption in certain cases of a combination of reciprocating engines and turbines which would otherwise be unnecessary.

Mr. Birger Ljungstrom, a Swedish engineer at Stockholm, designed this reaction turbine in which certain drawbacks to the usual type are avoided. He was assisted by his brother, Mr. Frederick Ljungstrom, producing a machine of an undoubtedly remarkable character. The Ljungstrom turbine is a radial flow reaction turbine, the steam being admitted between two discs, and in its passage from their centre to their circumference passing between concentric blading rings, carried alternately by the two discs. In the usual design both of the discs revolve, driving their shafts at equal speeds, but in opposite directions, and to each shaft is coupled an electric generator.



CROSS-SECTION THROUGH LJUNGSTROM STEAM TURBINE.

The relative speeds of each set of blades is thus twice as great as in a standard reaction turbine of equal revolutions and diameter, and thus for equal efficiency the total number of blade rows is only one-quarter as great. Moreover, as there is no split cast-iron carrying blades or dummy packings, the whole of these parts being mounted on the solid circular discs, the fear of distortion troubles is completely eliminated. The inventor has made provision for the highest superheat it is practicable to use, and disc design provides a very small turbine for the power developed, and although two generators are required, the overall size of the complete unit is materially less than that of an ordinary reaction turbo-generator of corresponding power.

At Liljeholmen, Sweden, the first turbine was built, which was so promising that a machine of practically identical design, but of 1,000 k.w. capacity, and complete with electric generators, was thoroughly tested and constructed, and gave excellent results. The 800 kw. steam turbine is in the centre, with an alternator on each side of it, and at the end of one of the alternator shafts is mounted a small exciter for the fields of both machines. The lower half of the turbine casing is formed into an exhaust branch, which is bolted direct to the condenser heat, without the intervention of any expansion joint or similar device.

The exhaust branch is the only rigid support the turbo generator possesses, so that the latter is as free as possible from any strain due to its attachments. There are springs contained in cast iron boxes beneath each generator which support the weight of these and prevent strains due to their overhang. It is intended to carry everything on the condenser alone, so that no foundations whatever are required except those for the condenser and auxiliary machinery. This, of course, is great practical convenience, apart altogether from the elimination of strains in the turbo generator.

There are two hand wheels on the upper part of the turbine casing, which admit extra steam from overloads, and allow for hand adjustment of operation under the feet of each generator are the spring boxes, while outside these again are the rectangular air ducts for the generators, rescending through the floor. The air enters by these ducts, and, after traversing the generators, escapes through the orifices on top of the turbine casings. Each generator has its independent air service and its own tachometer. The rectangular box underneath the exciter contains the oil-pump and cooler, and the governor is between the exciter and tachometer dial. There is the shield of the end alternator, and attached to the bearing a steel cable, traversing the outside of the exhaust branch in a sloping direction, and this cable is under tension, holding shut an oil relief valve in the relay actuating the stop-valve. The cable can be released either automatically by the melting of a very fusible metal plug in any of the bearings, or at will by a small lever at the stop valve.

In case it should break, get loose, or be released by the overheating of any bearing, the turbine is automatically shut down and there is an excess speed safety device on each alternator shaft, which also acts by releasing the cable and thus relieving the oil pressure. The 1,000 kw. steam turbine operates at 3,000 revolutions per minute and has an overall length of not more than 17 ft., 4 11-16 in.

The turbine is surrounded by exhaust space and there is no need for lagging of any kind upon the surface of the casing, which never exceeds the condenser temperature, and this not only minimizes radiation losses and permits of ready access to the bolts, but conduces to a pleasant temperature in the neighborhood of the machine.

The steam, after leaving the stop valve, enters the casing by a pipe passing through the side of the exhaust branch, where it branches off and ascends to the turbine by means of two vertical pipes, which are of steel. Radia-

tion from them is minimized by jackets of thin steel, enclosing an air space, and the branched pipe is made by welding, the jackets being also welded on.

It will be noted that they are turned down on the outside, leaving a shallow collar about ½ in. wide near the end, this collar being a tight fit into a thin steel bush firmly fixed into the cast steel side discs of the turbine. These side discs fit in turned seatings in the casing, and serve to locate the turbine. When the turbine is removed it is lifted off the ends of the branch pipes.

Except around the collar there is no contact between the pipe and the bush, but steam freely circulates between them. The steam from each pipe enters an annular chamber in the side discs, whence it passes by means of a number of large holes to the space between the turbine discs. The opposing faces between the turbine discs carry rings of blading, supported from the discs by means of conical rings of bull-headed section.

When the steam leaves the last blade-ring it enters a diffuser comprising a number of diverging channels in which the residual steam velocity is re-converted into pressure, and the vacuum at the blade edges thus lightly increased above that maintained in the condenser. It is of interest to note that this diffuser is built up of sheet steel by welding, and is mounted on suitable supports in the turbine casing, and it comes away with the turbine when the latter is removed. In such a turbine steam packings have to be provided both to prevent the steam escaping along the shafts where the latter pass through the side discs and also to prevent it escaping freely up the back of the running discs, and thus uselessly into the condenser.

This packing has to fulfil another function constituting a balancing device to neutralize the pressure of the working steam, tending to force the discs apart. When the turbine is required to take an overload steam is admitted to the annular chambers, by means of either or both of the overload valves on the casing, which allows it to pass through the turbine discs.

Each turbine shaft is hollow and carries the running part of the packing and the turbine discs. The packing is mounted on solid feathers, and held in position against a collar by the turbine disc between which and the packing are two concave spring washers. The disc is keyed to the shaft by a number of taper pins, and is held from coming off by a flanged spigot screwed into the end of the shaft. The turbine shafts themselves have no bearings, but are registered and fastened with set screws each to its own generator shaft, the bearings belonging to the latter. There is, however, very little overhang as each turbine shaft is only about 10½ feet long.

The weight of the two running discs, complete with blading, being only 265 lbs. and 303 lbs. respectively, no difficulty is experienced in securing true running. It is of interest to note the small dimensions of the turbine, namely 27¾ in. diameter by 20⅞ in. long. Extreme care has been taken at every point to minimize heat losses and to avoid possible trouble from the very high superheats for which the turbine is designed.

It may be mentioned that the only external parts of the turbine which are heated by live steam are the small surfaces of the side discs and these are lagged and cased with sheet metal. Every part is circular and without flanges or horizontal joints. The packings, dummies, turbine discs and blading system are all of nickel steel, and wherever there is either a gradual or an abrupt temperature gradient steps are taken to provide against distortion. This is particularly noticeable in the formation of the turbine discs, which are nearly cut through in places by deep annular grooves, to avoid the distortion which would inevitably otherwise occur in thick discs highly heated at the centre and comparatively cool at the circumference, against distortion, there is a system of conical rings forming a connection between parts which are liable to be momentarily or permanently of different temperature and the side discs, which are hot, are held to their supporting rings, which are cold, by this device. The two sets of the dummy discs are similarly supported, one to a facing on its side disc and the other to the back of its turbine disc.

Every individual blade-ring is fixed to one or other of the turbine discs by the same method of attachment. How these rings are made and fixed will be described in conjunction with the blading.

The blading of the Ljungstrom turbine consists of a number of concentric blade rings carried alternately by the two turbine discs. It will be seen that in the 1,000 kw. turbine there are altogether thirty-eight rings, the blades being of the Parsons pattern. From the centre the first 33 rows are 5 mm. wide, the next 2 are 7 mm. wide, and the last 2 12 mm. and 20 mm. wide respectively. The blading is first made in lengths of about 3 ft., being milled from the solid round bar of nickel steel. This is done on an ordinary horizontal milling machine, having four formed cutters mounted on its spindle. The first cutter roughs out the convex side of the blade, the next finishes this side, and the third and fourth respectively rough out and finish the hollow side, while the blade strip is extremely well finished when it leaves the machine. Still it is polished to a mirror-like surface, both inside and out, before it is built into the rings. Polishing is effected by the use of a simple machine using a tape band about 2½ in. wide, treated with polishing paste.

The discs, which are of soft iron, are mounted on a mandrel and their edges turned, inside and out, to the proper contour, and they are then dismounted and punched to receive the ends of the blading, a second punching process nicking the inner faces of the discs in such a way as to form registers for holding the blades to the exact angle. When the punching is done, the discs are reassembled on the mandrel with the blades in proper position. The mandrel is then held vertically and the rim of the disc and projecting blade roots are welded up solid together by melting iron wire into the groove by the aid of an oxy-acetylene blow lamp. Both ends of the blades having been welded into the discs by this process, which is neither difficult nor particularly slow, the mandrel is again put in the lathe and the discs and welded part are turned down and the ring parted.

The ring then consists of band blades with homogeneous root rings at each end, the latter having a small and slightly dovetailed mate register formed on the outer faces of the proportions. The very small pitch of the blades, as compared with standard practice, is also noticeable, the pitch sometimes being less than ⅛ in. The discs on the mandrel are ready to have their edges again turned to form rings of smaller diameter. Strengthening rings are next to be fixed to each end of the blade ring. These strengthening rings are made of spring steel containing 6 per cent. of carbon.

The strengthening ring is first formed on the circumference of a disc, and before it is parted off its side faces are machined. While the disc is still in the lathe the dovetail on the blade ring is entered into the groove on the face of the strengthening ring, and the edges of the latter squeezed in, so as to grip the dovetail tightly. To effect this, a simple device, consisting essentially of a pair of hinged arms, having rollers at their ends, is carried by the tool rest of the lathe. The arms embrace the ring and the rollers are brought towards each other to bear against the inside and outside of the dovetail joint by means of a screw.

When the lathe is started and pressure maintained on the rollers, the edges of the groove are rapidly and firmly closed upon the dovetail and to all intents. The outboard strengthening ring is the first to be formed, and when the blade ring is secured to it the composite ring is then parted off. The other strengthening ring is then formed, and after having the composite ring inserted and fixed, this also is parted from its disc.

There is then completed a blade ring but for the fine radial fins on the exterior circumference which are provided for afterwards. The conical, double bulb-headed ring connecting the blade ring to the turbine disc is turned from the edge of a steel disc, but before it is parted off the blade ring is closed on to it by rollers in the manner already described, and the rectangular steel seating ring, which is caulked into a recess in the turbine disc, is also closed on to it in the same way.

The conical ring is then severed from its parent disc. The complete element, consisting of blades, strengthening ring, conical ring and seating ring is then lightly chucked in the lathe and a groove is turned round the outside of each of the strengthening rings.

Into each groove a U-shaped section of extremely thin nickel is inserted and secured by a piece of wire rolled into it.

A finishing cut over the nickel fins and on the internal points opposite the corresponding fins of the next smaller blade ring completes the process. The seating ring is fixed into its recess in the turbine disc by means of a piece of iron wire caulked in on one side of it. The ends of this wire are left slightly turned up, so that they can be gripped by a pair of pliers in case it is necessary to extract the ring.

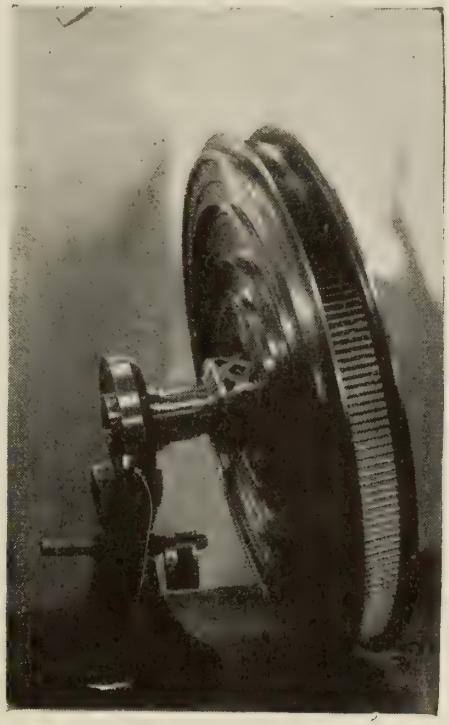
The rings are turned out of solid steel and are designed to expand freely in all directions without distortion. They are mounted on feathers, the fixed ones in the side disc. There are no less than 158 constructions for the steam, although the packing occupies less than 3¼ in. of the shaft. The circumferential labyrinth walls of the rings are turned with thin edges. These edges are then rolled inwards, thus forming minute internal conical flanges. When first made these flanges exactly fit the walls of the next rings, which they embrace, but a few minutes running suffices to wear a minute working clearance, which is maintained unaltered afterwards.

Actual tests showed the leakage steam from both packings of the 1,000 kw. machine amounted to only about 110 lb. per hr. What steam does pass does not find its way into the generator or the engine room, but is led into a chamber, in the side discs, around the packing, whence it is taken to a feed water heater or elsewhere by a special pipe. Not only the shaft-packing but also all other labyrinth packings in the turbine, adjust their own clearances in the same way. On account of the thinness of the fins no dangerous heating occurs in case of contact, even should the running parts shift out of centre. At the same time such an occurrence as this is very carefully guarded against by the self-contained arrangement of the whole plant, its great stiffness and its symmetric form affording temperature differences the least possible chance of altering the central position to which the bearings are originally adjusted. This, together with the very rigid construction of the rotor shaft, which will later be referred to, seems to constitute the necessary conditions for the maintenance of small clearance and leakage in prolonged use and continued safe running of the plant.

The clearances of the labyrinth edges at different radii of the 1,000 kw. turbine from the shaft packing outwards to the larger blade rings, are easily maintained at .004 in. to .010 in., even with the high superheat used. The high pressure being confined to the inner parts, which are of small radius, the leakage as calculated comes out very moderate, even when using steam of very high superheat, as already demonstrated, but also very high pressures.

To start the turbine the handle at the top is screwed back a few turns, and the steam then raises the disc valve from its seat, and equalizes the pressure above and below it. The double heat piston valve above is a sufficiently easy fit in its sleeve to permit of a small amount of leakage past it, and this is quite sufficient to warm up the small mass of the pump in the oil box as the end of the turbine is then worked by hand for a few strokes until the oil pressure is sufficient to raise the piston on the valve spindle against the downward pressure of its spring.

The turbine then starts, and within about ten minutes from the commencement of warming up is running at its full speed of 3,000 revolutions per minute. When starting there is, of course, no reason why the two sides of the turbine should drive their respective alternators at precisely the same speed and, as a matter of fact, they do not do so. But when the speed rises to about 1,400



TURBINE DISC AND BLADE RINGS FOR 1,000 KW TURBINE.

revolutions the exciting current becomes strong enough to cause the two generators automatically to synchronize themselves and thenceforward to run electrically as one machine. The automatic synchronization can be easily seen by watching the behaviour of the switchboard instruments. The fields of the two machines are connected in series, so that a single field rheostat only is needed, and in ordinary practice no more switches or instruments would be required than are necessary for the control of an ordinary generator.

In case either of the generators become disabled, provision is made for bolting it rigidly to the casing, so that, if necessary, the other generator alone may be used. The result would be a reduction of output by one half, and higher steam consumption per unit, but the frequency and voltage being normal the supply could be maintained in emergency.

There is an arrangement of the emergency trip lever and the valve connected to it which releases the oil pressure and causes the main valve to be closed. The tension cable, already described as causing the stoppage of the turbine if it is slackened by any cause, such as too high speed or unduly heated bearings, passes through the small hole in the toe of the emergency lever. By turning down this lever into a horizontal position the oil pressure is released and the turbine stopped.

This method of stopping can be used whenever desired, as it obviously interferes in no way with the adjustment of the cable. Another point worthy of note is the attachment of the pipe leading from the stop valve to the turbine. This is formed by oxy-acetylene welding, and is designed to prevent expansion troubles from the high superheat, amounting to nearly 300 degrees F., which is normally used. The simple circular form of the valves and casing is maintained with the same object.

For regulation the governor is driven by means of a worm on the generator shaft and has no special features. It controls the stop valve by means of an oil relay. The bearings are short for their diameter and consist of cast iron steps, turned cylindrically on the outside and lined with sheet metal. The two halves are registered by two long pins fitting in holes drilled along the sides of the joint when the halves are clamped together. The set screws holding the half steps together prevent the pins from working out endways. The pair of steps is located centrally by four pads fastened on to the spherical heads of screws which project through the housing, and form a means of adjustment for the position of the shaft.

The bearing caps are secured by taper fitting bolts, with a nut at each end. This type of bolt is used throughout the turbine, all the casing bolts being thus made. It is claimed that they are very cheaply made and fitted, and when in position they serve to locate the parts they hold together with absolute accuracy. They are easily withdrawn by tightening one of the nuts. The oil supply is led to the bearings by a pipe entering the bottom step. This pipe is placed inside the discharge pipe from the bearing.

The incoming oil passes through holes machined in the bottom step and emerges at the horizontal diameter at one end, whence it flows to the other end along clearances provided for the purpose in the top step. The spent oil returns to the pump from the bottom of the bearing by the outer of the two concentric pipes shown. There is no water cooling of the bearings, the oil alone being relied on to carry away the heat. The circulation of oil amounts to a pint per second for each bearing. The oil pump is of the gear type and is driven directly by the governor spindle.

The oil pump maintains a pressure of about 34 lbs. per sq. in., but this is lowered to about 15 lb. per square in. for the bearings by the use of a reducing valve. The higher pressure is maintained beneath the piston controlling the throttle valve, this pressure being regulated by a slide valve operated by the

governor. Variations of oil pressure thus vary the position of the throttle valve, and this. in turn, by means of a floating lever and side shaft, reacts upon the oil system, so as to maintain a constant relationship between the position of the stop valve and that of the governor.

The force available for keeping the throttle valve closed is about 360 lb., but the spring tension in its working position is double this amount, so that should the emergency device or other cause release the oil pressure a force of about 720 lbs. is applied to the closing of the throttle. A fan maintains an air pressure of 6 in. water gauge in the end of the alternator casing, and thus a tremendous blast is created axially through the machine. The air escapes through orifices in the casing, above the top of the inner generator bearings, and notwithstanding the blast, the machine runs in a way that compares exceedingly well, as to silence, with any ordinary turbo generator.

During the construction of both 500 kw. and the 1,000 kw. machines all work was carried out on a purely manufacturing basis, and exact labor, material and management costs have been kept concerning every important detail. The cost-keeping system was in fact, better than in many manufacturing works, and altogether unusual in connection with work of a preliminary and somewhat experimental nature. From estimates formed on this basis engineer Ljungstrom says that his turbine is extremely cheap to build.

The inventor says, "that the economy already attained with the Ljungstrom turbo generator for stationary purposes has been sufficiently noteworthy. For marine propulsion, however, the prospects are, I consider, still more favorable with respect to size, cost and efficiency since the voltage need not necessarily be kept constant under various loads. Consequently the stator windings may be calculated for delivering about 70 or 80 per cent. more current than is usual with the same size of the generator, with but a comparatively very small increase in the total losses and with a corresponding increase in effectiveness."

If the electric motors be dimensioned carefully, and for a high peripheral speed, the overall efficiency of the electric transmission turns out to be very high, and exhaustive calculations show that under favorable conditions 90 to 92 per cent. is obtainable. The thermo dynamical efficiency of the turbine, based on results already attained with a 1,000 kw. set, and giving due consideration for later improvements and the larger power, should, for 4,500 kw. at 3,000 revolutions per minute, I consider, reach about 85 per cent.

For a turbo generator and condenser of 4,500 kw. capacity with generators of special design for ship propulsion, the main dimensions are length, 23 ft., 7 in. (7189 mm.) width, 6 ft., 7 in., (2010 mm.) height, including condenser, 14 ft., 6 in., (4420 mm.) The weight of the turbo generator alone is about 34 tons, and the total for the whole plant with pump and water in the condenser, is 65 tons, or 11.5 lb. and 22 lb. per brake horse power respectively. On the exterior the turbo generator is kept at the temperature of the condenser, which has special advantages, particularly in tropical climates.

The weight and size of the electric motors vary considerably with the periodicity, peripheral speed and the proportion of diameter to length. With 50 periods in certain cases, the weight cannot be reduced to less than 38 lbs. (17.25kg.) per brake horse power, whereas in a destroyer, with 100 periods and with the rotors running at 400 to 500 revolutions per minute in a light framing of steel casting or autogeneously welded plating, the weight is about 9 lb. to 10 lb. (4.08 kg. to 4.54 kg.) per brake horse power.

In this case the turbo generators, without condensing machinery, and running at 6,000 revolutions per minute will show about the same weight per brake horse power. With synchronous electric motors on the propeller shafts, manoeuvring does not involve any difficulties, two or three motors may be built together in one casing, and by coupling them in cascade the shaft is caused to run at one half or one third of its normal speed. Other speeds are obtained by slowing down the turbines. On reversing resistances should be switched into the rotor circuits. If these resistances are made adjustable and of ample dimensions, they also may be used exclusively for varying the speed of the motors, thus doing away with the necessity for cascade coupling, or variation in turbine speed.

THERMIT WELDING FOR MARINE REPAIRS

An important development of Thermit welding in American shipyards is anticipated by the recent approval by the American Bureau of Shipping of the Thermit process for welding stern frames, rubber frames, and other heavy sections on ships registered under their classification. The only qualification is that this bureau be notified sufficiently in advance to have a surveyor in attendance during the welding operation as well as to inspect and test the weld when completed.

While the Thermit process has been used since 1903 for making marine repairs and has a great many successful welds of this nature to its credit the process was never officially approved by the American Bureau of Shipping and most of the repairs were made on vessels not classed by them. It is due entirely to the unbroken record of successful marine welds that the bureau now accords its official sanction to the process. According to a statement by the Metal & Thermit Corporation there has never been a single failure of a Thermit marine weld so far as it has been able to ascertain in all the years that the process has been under this company's jurisdiction.

Now that the United States promises to have one of the largest mercantile marines in the world, and as practically all of the ships which have recently been constructed, and which will be constructed in the future, will be registered with the American Bureau of Shipping, the recognition of the Thermit process by that bureau bids fair to result in many important Thermit marine welds from now on.

HALIFAX SHIPYARDS BUSY

The Halifax Shipyards have just completed the repairing and rebuilding of the "Lake Manitoba," the former Canadian Pacific steamer. It will be recalled that this vessel caught fire while unloading oil at the wharf of the Imperial Oil Company at Long Point, Montreal, in the summer of 1918. She was badly gutted and had to be partially submerged before the fire was under control. After the fire she was bought by the Bishop Navigation Company, and the Halifax Shipyards got the contract to rebuild her, as that is what was required. All her beams, pillars, and frames were badly twisted, and the passenger accommodation was utterly destroyed. The "Lake Manitoba" was taken round to Halifax in tow, and on the voyage met with further misfortune by running into a heavy gale of wind, and becoming separated from her tugs. She was adrift for 36 hours before they succeeded in picking her up again, and bringing her safely into Halifax. The vessel, completely rebuilt and equipped, is now ready to enter into useful occupation again, and will sail shortly from Halifax to Philadelphia to load cargo for Genoa. She has been renamed the "Iver Heath."

The Halifax Shipyards have besides this big job, so successfully carried out, four keels laid for four new steamers for the Canadian Government Merchant Marine. The first of these vessels will be launched next spring. In the dry dock is the steamer "Troja," recently salvaged from the Bay of Fundy, while alongside the wharf is the car ferry "Nova Scotia," which is receiving a new bow.

This fine shipbuilding and repairing plant should be in a position to give American Atlantic coast dry docks pretty keen competition, and bring a good deal of money formerly spent with them to Halifax.

Portable Plant.—The Electric Welding Company, 178 Bleury St., Montreal, which has been in business since the beginning of June, has now in service a portable plant mounted on a 2-ton truck that can be taken to any point for immediate repair work. The plant consists of a 30 h.p. Matthews gasoline engine, connected to a 250 ampere Lincoln generator. H. H. Getz and F. Alcott, both experienced men, are associated with the company.

An Adventure in Zoology

By T. H. FENNER

ABOUT three miles out in the country, near to one of the leading Canadian Atlantic coast ports, there used to be a hostelry of the type known to fame as a roadhouse.

The proprietor of this haven of rest was somewhat of a character. Not content with ministering to the material wants of his patrons, he sought to educate and elevate their minds. For this purpose he had a portion of his back garden fenced off, and divided into cribs, in each of which was a representative of Canada's fur-bearing animals. He had quite a good collection, and it was always kept up, deaths in the family being promptly replaced. He even had a couple of snakes, which, while not exactly fur-bearing, yet had their place in the scheme of things. The worthy host believed in fair play and said he did not see why the seeing of snakes should be confined to one portion of his customers alone.

Those were the days when a poor sailorman could wet his whistle without having to crawl up a back alley and remember the pass word. This particular place used to be well patronized by officers and engineers of the ships visiting the port. Sunday evenings it was quite common to see a number of them enjoying a good dinner, accompanied by the wine of the country. The change from ship diet was pleasant, and there was usually someone to play the piano, while the others sang or listened. In my unregenerate youth I passed some pleasant hours in that hospitable circle. At the time of which I write I was sailing between Canadian ports and Cuba, Mexico, and the West Indies and when in this particular port never failed to visit the "Three-Mile House," as it was known. In this way I got quite friendly with mine host, and he would usually come over and sit down to chat for a while when he saw me. One Sunday afternoon I got hold of the chief officer after lunch and we strolled up the road, till we were pretty close to the menagerie. The day was warm and we decided to go in and stay for dinner.

Things were pretty quiet when we got in, and we found a table under a spreading maple and were soon joined by our host. We yarned awhile about various subjects, till the conversation turned to different voyages, and the animals of different countries. I was telling him of the elephants in the lumber yards of Moulmein, and he was much interested. Jokingly, I said to him, "Why don't you get some foreign animals for your zoo? They would be a great attraction, people are getting so used to your coons and skunks that they hardly look at them."

"I have often thought of that, but where could I get them?" he said.

"Well," I said, "no doubt you would have to buy them. You couldn't attract them by your personality." He thanked me for the advice, and relapsed into thoughtful silence. I smoothed things over by giving him a good Havana cigar, which wasn't made in Canada, and he reciprocated by furnishing the proper accompaniment for a good cigar, and the dove of peace descended among us.

Just then I noticed that Wilkinson, the chief officer, was getting fidgety. (I call him Wilkinson, because that wasn't his name). He put his hands in his pockets, and took them out again (empty). Put his hat on the back of his head, ran his fingers through his hair, and pulled the cap down again. I recognized the symptoms. He was getting an idea, and this was always accompanied by severe physical distress. I forgot to tell you he was a Yorkshireman, and it used to be said that if he didn't start for the bridge at seven bells, the sun would be past the meridian before he got there. Now, whenever he developed an idea it was usually along lines that tended towards profit to himself, so I sat patiently and waited to see what was coming. It wasn't as long as it might have been, at that, but the silence was becoming oppressive.

"Supposing someone was to bring you a good wild animal from abroad," he asked mine host, "would you give a fair price for it?"

I sat up with a jerk. Here was a sight for the gods, a Yorkshireman about to bargain with a Bluenose. I have seen a Chinese bum boat man trying to sell cheroots to a Glasgow steward, but even that, I felt, would be tame compared to this. There was still an hour to go before dinner time. I had the glasses replenished and sat back in pure content.

The padrone was interested, that was plain. That he was anxious to appear indifferent was also quite evident. Willie (Wilkinson's pet name), having once scented a dollar was prepared to follow it to the bitter end. I was wondering what kind of a beast he was going to capture as the worst thing I had met in Mexico were the mosquitoes and there was no need to buy them. However I was just a spectator.

The boss spoke. "Well, of course, that would depend. For something real good, like a leopard, or a crocodile, I'd pay handsome. Of course I would be taking a big risk. It might die on me, and then I'd be out. They cost a lot to feed, too. Oh, I'd say $25." Willie gave a look of pure disgust. His accent, usually not noticeable, was broad and strong. "Ah thought so. Tha waants animals and tha waans them for naught. It 'ud cost me ower that to feed him on the trip whoam."

Thus the battle started and see-sawed up and down, till finally the bargain was sealed. Willie was to bring two or three good specimens of Mexico's fauna, for which, in good condition, he was to receive $50 each. At the time I wasn't in on it. However, I was later on. We were sworn to secrecy as if the news got out, our host was afraid of being swamped under a flood of strange beasts, to pay for which he would have to sell the house. We promised, and some of the boys coming in, went to dinner and spent the evening pleasantly, getting aboard in good condition about midnight. We sailed a couple of days later, and kept away from the inn for fear the boss would go back on his bargain.

* * *

Before we reached Nassau, outward bound, Willie had reluctantly come to the conclusion that he would need help. He approached me on the subject one night, suggesting that as the weather would be getting cold on the homeward voyage, it might be necessary to put the animals in the engine room store room. Would I work this for him? I thought it would be very difficult, but finally agreed to help, on condition that I went into the deal on a partnership basis. Willie consented, feeling that he couldn't do without me very well.

We called at Nassau, Havana, Vera Cruz, Tampico, and Progreso, before going home, and we decided that Tampico was the likeliest spot to get our specimens. I don't know if any of you who read this have been in Tampico, but, if not, I can assure you it's wild enough for anything. Furthermore, Willie averred that on a previous voyage he had seen a stall in the main street, where animals were on sale. I took his word for it, but all I had ever seen in Tampico were buzzards and mosquitos, and believe me, the 'skeeters were nearly as big as the buzzards.

We spent a pleasant week in Havana, which is a pretty good spot to lay in, and went on to Vera Cruz, where Willie and I nearly ended our days in a dungeon. However, we got out of that little difficulty, and left Vera Cruz for Tampico, where the animal hunt was to commence. We arrived there about 8 p.m., just as the mosquitoes were getting into their swing.

Willie was for going ashore right away, on a still hunt. My commercial instincts were not so highly developed,

and furthermore, I had to see things all right down below before I was free. Besides that, I had a better idea. The Mexican longshoremen, picturesque rascals in their high, conical hats, ragged shirts and pants, and bare feet, were all experts at petty larceny. Their foreman, by virtue of his position, was a bigger thief than any of them, and to him I turned. I knew if there was anything in the nature of a wild animal in town he would steal it, thus enabling us to acquire it at something less than the market price. The next morning I got this pinchbeck pirate to one side, and made known to him our wants. He responded immediately, and assured me he knew just the thing we wanted, and would come aboard that night when things were quiet and bring the denizens of the jungle for our approval. I informed my partner of the arrangements and he paid me the doubtful compliment of asserting that I was nearly smart enough to be a Yorkshireman. The day went by with its usual accompaniment of winch break-downs, incessant watch to prevent the stevedores stealing the main bearings of the winches when we had them out for repairs, and all the minor discomforts of heat, badly cooked food, and a short-tempered chief. Anyway, it passed, and eight o'clock found us pacing the wharf in anxious suspense, awaiting the arrival of our live stock. Willie, cautious as ever, had shoved a ladder over the poop so that we could get aboard without disturbing the quartermaster at the gang way. We didn't have to wait long before we saw a man coming down the wharf, followed closely by two others, each carrying a bag over his shoulder. They were looking behind them every few steps, and I knew my guess had been right. Our friend had procured the animals in the easiest way. Silently, Willie pointed to the ladder, and led the way up, while the two peons followed, myself bringing up the rear. Under the poop had once been second cabin accommodation, but was now unoccupied. Willie had the keys, and we filed silently into the now empty dining saloon, and once inside, the head thief told his companions to deposit their burdens. He gave them a few cents each and bade them depart. He closed the door carefully after them, and then, with the air of a world-renowned prestidigateur, approached the nearest bag. He undid the fastening, and proceeded to shake the occupant out of his temporary home. He was very reluctant to come, and the longshoreman very impatient, and I have always regretted my knowledge of Spanish was so limited. I would have liked to get the gist of what he was saying. Finally, after a particularly vigorous shake, the sack gave way and out tumbled a ball of fur, with two extensions fore and aft, about equal length, and lay where it fell. By dint of some prodding, the beast unfolded itself and stood revealed. Well, if that Mexican had made the thing himself he couldn't have been more proud. He stood there looking like Napoleon must have felt at Austerlitz, while the poor brute on the floor gazed around with an expression of mixed disgust and enquiry. I don't know if any of my readers have seen an ant eater, which was what the thing was, but if you took a Dachshund, put a long spiky tail on him and an equally long spiky nose, and covered him with fur, you would get a good idea of the thing. He seemed sad and dispirited, but that might have been due to the sudden changes he had passed through in recent hours. For our purpose he seemed suitable enough, and would cause quite a flutter of interest among the nature lovers at the Three-Mile House. I signalled our approval to the purveyor, and told him to proceed to the next. Willie and the ant eater were looking at each other like two people at a party who would like to speak, but hadn't been introduced yet. I knew that it would be against Willie's principles to show any sign of satisfaction, so transferred my attention to the second bag.

Evidently the occupant of this had a little more pep than the ant eater. The bag was squirming around as though the thing inside it was uncomfortable. The Mexican didn't approach it in the free and easy way that he had the other. He drew his knife, and, approaching cautiously, leaned over and slit the bag from one end to the other with a deft stroke. Out jumped a tawny-colored brute, about the size of a good bull terrier, with a head two sizes too big for his body, enormous paws, and a long tail, lashing his sides like a fury. I stepped back in a hurry, and the brute stood there, looking at us with eyes blazing like the light on the Lizards. He was waiting for the next move, and so was I, but Willie, encouraged no doubt by the attitude of the ant eater, bent down and held his hand out as one would to a strange dog. The animal made a vicious flip with his paw, and Willie moved back, probably quicker than he ever did in his life. Then we all stood still again. As far as I could see, the thing was all head and feet, and its feet were decorated with claws an inch long. The Mexican, grinning all over, made a quick jab and caught the beast by the scruff of the neck, as though he were a kitten, and lifted him off his feet, and he hung there snarling and spitting like a devil. He motioned us to the door, and, suddenly flinging the animal into a corner, joined us at the door and shoved us through. He came out with us, and closed the door. I was much relieved at this move, but could not help wondering at what we were going to do with the playful brute. However, the Mexican explained that if we left him alone for a day or two he would be hungry, and by throwing him a little food he would get used to us. Furthermore, he would get very sick when we left port, and would be then quite docile. He said it was a mountain lion, and quite young. It would grow a little more, but not much, and would be worth $100 in Halifax. Willie, who had not recovered from his shock till then, came to life at the mention of $100, and swore no mountain lion would ever get the better of him. We finally gave the man $10 for the two animals and he departed joyfully.

I decided that the ant eater would be my special charge, leaving the lion taming to Willie. This suddenly made me wonder if the lion had eaten the ant eater, and that, if not already dead, we had better separate them. The light was still on, and I opened the door cautiously and peeped in. The ant eater was curled up in a ball, peacefully sleeping near the door, and the lion was pacing up and down on the far side of the saloon. He looked around when I opened the door, but made no move to come over, so I slowly advanced, picked up my charge and got out again as soon as possible. I put the little fellow in the engine room store room, and tied a spunyarn round his neck, so he couldn't get away. I may say he never was any trouble, and seemed to thrive on the ship's beetles and cockroaches, with an occasional egg. He grew quite friendly with all hands and was quite a pet.

However, Mr. Lion was a different proposition. He seemed to have a mean nature, and resented any approaches we tried to make. So, for a day or two, we were content to throw him a bit of meat now and again, and put a pail of water for him to drink. When we got away from Tampico we struck a spell of head winds, and pitched quite a little, and sure enough, it seemed to take all the sand out of our friend. He was just plain seasick, and in that state he finally allowed Willie to feed him some milk. As he got better, Willie began to take food to him, and while they never got real friendly, they were at least on speaking terms. Encouraged by this, Willie made a nice plaited collar for him, put a thimble on it, and rove a small rope through. He was going to take him out for exercise. When the day approached, Willie told me his intention, and said to keep it quiet. I did, telling no one but the steward. That was equivalent to publishing it in a daily paper.

I lent the gallant lion tamer a piece of 7-8 inch square packing, which is an excellent persuader. Armed with this, and the collar with rope attached, Willie disappeared into the poop house. Everyone who could come were by this time notified, and lined up on the after end of the bridge deck, to watch the fun. For a few minutes there was silence, and then the air was rent by a blood-curdling scream, but whether it was the lion or Willie I don't know to this day. Sounds as of a lively battle rolled around the poop, and suddenly out of the door with a bound that carried him to the mainmast came the lion. He wore no collar

and seemed peeved. He stood there blinking his eyes in the strong sunlight, the first he had seen for days. Raising his head he saw the row of men on the bridge deck, and gazed long and earnestly in our direction. He seemed to me to be bigger than I had at first thought, but pretty thin, and his head and feet were still too much in evidence for symmetry. However, I didn't waste much time looking at him, for a murmur along the line bespoke something else of interest. It must be Willie. He came out much more slowly than his pet, and his appearance was not any better, one leg of his trousers being in rags and the leg itself was bleeding. His cap was missing, and he had a beautiful gravel rash on his cheek, where he had probably slid along the deck. He still retained the collar, and the piece of packing. As he slowly and painfully stood out on deck, all hands gave him a rousing cheer. He didn't respond at all gracefully, but what he said was forceful. The purser, who felt he was an authority on animals, having once been taken to Kew Gardens when a baby, offered some advice: "Get to loo'ard of him, Willie. He can smell you now." This was good hunting logic, but Willie took it as a personal insult. "When ah gets through with this —— ——, ah'll make thee so's thee can smell nowt," he growled. Meanwhile the object of the chase, hearing or sensing his would-be master behind him, cast anxious glances around for a haven. Suddenly with a beautiful jump, right over the corner of the hatch, it dodged round in between the winches. Willie called for volunteers, and appealed specially to me as his partner for active support. I wasn't keen on the job, but saw that I had to step up, or or for ever lose caste.

I buttoned my coat and walked down the ladder on to the port side of the main deck till I was abreast of the winches. There I stood looking at Willie. Our commercial enterprise looked at us both in turn. The audience on the bridge deck offered encouragement, but no more volunteers arrived. I was looking at the deck pipe running to the winches and noticed a small pet-cock open, and pointing at Mr. Lion. Incidentally that was away from me, and towards both Willie and the pet. A bright idea struck me. "Well, Mr. Mate," I called to my partner, "you're in command. What's the orders?"

Full well I knew that Willie couldn't formulate any clear ideas to deal with such an unusual situation without long and careful preparation. I followed up my question pretty quick with: "I'll be back in a minute. I'm just going to the engine-room door." Willie looked doubtful, and was about to remonstrate, but I had covered the short distance to the engine-room door before he could think up a speech. I whistled softly, and the third looked up from the bottom platform. I beckoned him up and gave him some instructions, and walked back. Willie was still looking pained. "Well, what's doing?" I asked cheerfully. "We've got to get him out of there where there is some room," replied the lion tamer. "I think he will go soon," I said, hopefully. I was watching the little pet-cock, out of which a trickle of water was coming. Softly and gently it issued forth and spread on the deck. Then it began hissing a little as the pressure began to come, and the animal looked around uneasily. He was nervous, and watched the water spreading on the deck anxiously. Willie approached a little nearer and heard the slight hissing noise, but didn't tumble to what it was. The bridge crowd had no notion of what was going on. The third was following out instructions like a bird. I watched the pet-cock closely till I saw the water disappearing and a thin white vapor curling from it. I stepped up and tapped the pipe sharply with the toe of my boot. The third heard the signal, and almost before the lion or Willie realized it, out came a jet of good live steam, which caught our four-footed friend right amidships. He let out another of the yells which I had heard before, and proceeded to get out. He got out alright, and Willie, being in his way, charged straight at him. There was a tawny flash between the poor mate's feet, and then Willie was flat on his back and the lion making tracks back to the poop. In he went, and I followed up and shut the door behind him. I took good care to keep a respectful distance from the mate, who was picking himself up slowly. The third had shut the steam off and the audience on the bridge were shrieking with joy. I suggested that it were better to melt away before the mate had fully recovered his faculties, for he was a powerful man and was not feeling at peace with his fellow creatures. I took my own advice and avoided Willie for about two days. In the meantime I enlisted the help of the doctor, and when I had established friendly relations with my partner again, suggested that he repair to the after end of the bridge deck the next afternoon and watch me take "his nibs" for a walk. I got the collar from Willie, and left him wondering.

Next day, before the same crowd, I walked into to the poop house and reappeared two minutes later before an admiring gallery, leading, or rather dragging the lion by the rope. The crowd wanted to come down and see the beast at close quarters, but I waved them back. Willie was still too suspicious to try him again. I took him twice round the deck and home again, leaving the collar on him. Oh, it was simple enough! The Doc. had fed him a piece of meat which was doped just enough to take all the fight out of him. We kept the secret, and, strange enough, the brute would always take the doped stuff, seeming to like the flavor. I used to get the Doc. now and again and take advantage of Willie being on the bridge to dope our friend, when I would lead him round. Whenever Willie would go near him he would show fight right away. Poor chap was nearly worried to death thinking how he was going to get him out to the place to sell him. Between that and the chaff the crowd got off at him he was not happy. Meanwhile, the lion had grown till he was as big as a good-sized Airedale and twice as heavy. He was getting big to handle.

Well, to make the yarn short, we got along towards our port without much more trouble. Someone, with malice aforethought, opened the poop house door one night, and some time in the middle watch our friend came out for a walk. He didn't meet anyone aft, and I suppose got curious. The chief was sleeping in his room at the after end of the alleyway, and his door was open. Mr. Leo went along and sniffed at the door, and some sense of impending danger caused the old chief to open his eyes. Looking straight into his were the blazing orbs of our pet, and the old chief mentally said good-bye to this world. However, the scene was too strange, and the brute walked off of his own accord and back to the poop. The chief had some pointed remarks to make at breakfast next morning. However, a couple of days later we made port, and our biggest problem stared us in the face.

The first night we had in port we bundled our mild and philosophical friend the ant eater into a bag, and hiring a rig, drove out to the Three-Mile House We were welcomed there with old-time hospitality, and much curiosity as to what was in the bag. After the preliminary ceremonies had been satisfactorily carried out we requested the landlord to go into his office, and we followed. Once inside we pulled our friend out of the bag, and the old boss was tickled to death. Joe (the anteater) seemed to be interested in seeing a new face, and the boss and he were soon friends. The possibilities of this new attraction so excited our host that he was in danger of forgetting the financial arrangement. I knew that matter was safe with my partner, and was therefore not surprised when Willie broke into our host's rhapsodies. "We'll take the fifty in cash, please, five ten dollar bills. No cheques." Great head for business had Willie.

After the money was paid we told about the other wonderful animal still aboard. Willie pulled up his trouser leg and showed the scar he got while effecting a capture. We went out and picked out a real good den, where a bear had once lived, to accommodate our savage specimen. Finally we persuaded the old man to promise $75 instead of $50 if the beast came up to our description. Well, we left early and went aboard. We then held council of war as to how we were to get the lion ashore and over the three intervening miles. I let Willie into the secret of the dope, and we agreed that we would give the animal a good dose the next afternoon. While he was under the influence we would rig a bridle to his collar and carry a line each side. In this way we could keep a fair distance away from him, and whichever way he jumped we could check him. We would have a

rig waiting at the top of the wharf and we would get in the rig and he could walk behind. It sounded good. However, things didn't break that way exactly. To begin with, when I went to the Doc. next morning for the dope, he said he had very little out. It had all been sealed up by the Customs. Furthermore, he was going away early that day and he would not leave the stuff with me. The best he would do was to dope a piece of beef and leave it in my charge. Now I had found it took about an hour, usually, to make the brute sleepy, and he would remain that way for about three hours. While under the influence he was quite mild and benevolent, and could be dragged around, and even kicked without eliciting more than a grunt. In his normal moments he would have tackled a hippopotamus. He was certainly a bad actor.

I reckoned on feeding him about 6 o'clock and having the rig engaged for 8 o'clock. This would enable us to leave while the lion would be agreeable to anything. We would deliver him about 8.30 or 8.45 and get him in the cage about the time he was getting himself again. After that we would collect our money and then our troubles would be over.

The weather was chilly. Not cold for Canada, but cooler a lot than Mexico. It was kind of shivery in the poop house when I went along to feed him and he seemed very restless. The noise all day working cargo seemed to have upset him. He snarled at me when I opened the door, but readily took the food I offered him. As soon as I saw him eating I hurried to Willie to see if he had the rigging ready. He had made two strong ropes with a loop for the hand at one end, and a ¼-inch shackle at the other. These would go on the thimble on the beast's collar, and we reckoned we could get one each side and keep him going.

In about three-quarters of an hour we went aft and peeped in. As I expected, the lion was lying down breathing heavily. We went up to him and rove our shackles on to his collar, after which we dragged him near the door and made our lines fast. We stretched them taut so that if our little pet wanted to move he couldn't. Afer this we went and made ourselves ready for the journey.

About a quarter to eight a boy came down the wharf with the news that the rig was there. We tipped him well and told him to clear out. The main deck was about level with the wharf, and we took the rail down opposite the hatch and laid a hatch cover across for a gangway to the wharf.

We went aft and found our friend still sleepy. He submitted quite calmly to being dragged on deck, and staggered to his feet once he was outside. He came ashore in good style, and we started the walk up the wharf, about a quarter of a mile. I prayed we wouldn't meet anyone, and didn't expect to at that time. Well, we sailed along, slowly but peacefully, till we were nearly at the head of the wharf. Here we came in sight of the horse and rig, the driver sitting on the box with his legs crossed, the reins hanging on the dashboard. The wind was blowing down the wharf, and I suppose carried the scent of the horse to our prisoner. It never struck me that he had not smelt another animal since joining us. He sniffed reminiscently, but I suppose his poor brain was too befuddled to really understand what was tickling his nostrils, I told Willie to stand by. By this time we were in plain view, and the driver had half turned on his box to have a better look. The horse turned his head, and seemed to be interested, but calm. Just at this juncture our pet took it into his head to let out one of his war-cries. In one second the peaceful scene was changed. The horse stood on his hind legs for an instant, and then jumped a clear six feet. The driver disappeared over the box into the rig backwards, and the whole equipage was out of sight in just 35 seconds from the time the lion spoke. We were clearly up against it. If we delayed while a second rig was procured, it would bring it perilously near the time when our pet's jag would be wearing off. On the other hand, if we walked all the way he might recover enough to get ugly on the road. I suggested going aboard again. Willie wanted to go on. He couldn't bear the thought of not getting the money that night. In the middle of the argument the subject of it split the night air with another yell, and began to get restless. That decided it. Off we started down the wharf. Hurrying footsteps sounded behind us. I looked round, and beheld the cabby, a policeman and three or four of his friends. They hailed us, so we stopped. The lion didn't want to stop. He was getting more lively every minute. I suppose the dose was smaller than usual, and the air was cold. We got him halted, and waited to see what was doing. The cabby and the policeman advanced. Cabby was in a state of great excitement, and we gathered that he wanted to be paid for the damage to his rig. We disclaimed any responsibility. He became abusive, and advanced threateningly. I whispered to Willie to give the lion a little slack on the rope, slacking my side at the same time. As I expected, Leo made a lunge at the stranger, who fell back in disorder. However, we had misjudged the weight behind that lunge, and when we got the heft of the brute on the ropes, we had to go with him. Once started, we couldn't bring up. The crowd went various ways, but the policeman, anxious to uphold the morale of the force, drew his gun. This was getting beyond a joke. I had seen a policeman shoot before, and knew the only thing safe was the one he was aiming at. I let go my end, shouting to Willie to do likewise. Willie, of course, had to think a while before making up his mind, the result being that he described a half-circle, bumping heavily into a post on the wharf before he could make up his mind. I jumped for a pile of timber, and the cop opened up his artillery. That settled poor Leo. It was something new for him. He made one dispairing yell, and then went off the edge of the wharf into the harbor. The policeman fired the remaining shots of his revolver in his general direction, and maybe hit him. We never saw him again, anyway. By this time the firing and general racket had brought down half the city, and in the general confusion we slipped away up town, and drove out to break the news.

Willie tried hard to collect something from our host on account of our trouble, but there was nothing doing. However, he stood us a good supper, and we got a very appreciative audience around our table while we told the story. The fun we had was worth the trouble, and anyway we had made $20 each on the ant eater. So like good sports we celebrated, and arrived aboard in the wee sma' hours, feeling as a famous opera star has put it: "Very very happy, but very very tired."

WAR LOSSES OF THE ROYAL NAVY ADMIRALTY RETURN

Over one thousand vessels of the Royal Navy, warships and auxiliaries, were lost during the war in action or by submarines, mines and other causes. exact number, according to a detailed return issued recently by the Secretary to the Admiralty, was 1,069, of which 254 were warships and 815 auxiliary vessels.

Of the warships, 13 were battleships, three battle cruisers, 13 cruisers, 12 light cruisers (including six sunk as block ships at Zeebrugge and Ostend), five monitors, three flotilla leaders, 64 torpedo-boat destroyers (including the Zulu and Nubian, which were damaged in action and afterwards made into one ship, named Nubian, and which are counted as a loss of one vessel, and 54 submarines, (including seven destroyed at Helsingfors to avoid capture).

Only 42 warships were lost in action, 62 falling victims to submarine attacks and 44 to mines. Eleven were destroyed to avoid capture, 28 were lost in collisions, 22 were wrecked, five were lost by internal explosions and seven by accident, while in 26 cases the cause of the loss was unknown.

Among the 815 auxiliary vessels in the list, 246 were hired trawlers, 244 were colliers, and 130 were hired drifters. There were 18 mine sweepers, two mine carriers, two hospital ships (the Rohilla, which was wrecked off Whitby in October, 1914, and the Rewa, which was sunk by enemy warship at the beginning of last year), 44 oilers, 29 special service ships, 14 tugs, 13 yachts, two whalers, 18 Admiralty trawlers, 24 motor launches, six motor vessels, one ammunition ship and nine fleet messengers.

A large proportion of these vessels were lost as the result of attacks by submarine, the number being 289, while 225 were destroyed by mines, and 43 went down as the result of actions. To collisions the loss of 93 auxiliaries is described, and 77 were wrecked, one was destroyed to avoid capture, and 18 were removed by fire, while in 31 cases the cause of the loss is unknown.

Eastern and Western Canada Marine Activities

October Correspondence

BRITISH COLUMBIA

THE shipbuilding situation on the Pacific Coast continues indefinite, and there have been no developments of importance during the past month in this connection, although the atmosphere has been filled with rumors.

While no official announcement has yet been made, it seems more than likely that contracts for at least four more steel cargo-carriers will be awarded to Vancouver shipyards by the Dominion Government. Such an order would keep the Coughlan and Wallace yards moderately busy for several months and would have the result of absorbing considerable labor that otherwise might be unemployed the greater part of the winter.

A dispatch from Ottawa, October 1, gave Mr. H. H. Stevens, M.P. for Vancouver, credit for a statement to the effect that Vancouver shipyards would probably be given contracts for four more ships, but following that the Government would leave further building to private enterprise. A fleet of fifty-three vessels, it was felt, was a large enough Government-owned mercantile marine. Mr. Stevens stated that he had impressed the Government that unemployment on a large scale would be the natural consequence if no more contracts were let, and that it was now practically decided that four more ships would be built.

The wooden shipbuilding situation is even more perplexing. The Foundation Company at Victoria, which has been working on a contract with the French Government for the construction of twenty 3,500-ton wooden steamships, launched its last boat a few days ago, and the eight ways are now being allowed to stand idle for the first time in two years. The Cholberg Shipyard, also in Victoria, is building wooden schooners to Norwegian account, but will soon have completed its contract. On the mainland, little wooden shipbuilding is going on, and the Northern Construction Company, which was launched at the commencement of the Imperial Munitions Board programme recently completed its last ship and closed down.

The future of the wooden yards can best be expressed, perhaps, simply by a big question mark. The yard operators have made strong efforts to secure new orders, but so far have failed to get more than a few vague possibilities in which the "if" element is more or less prominent. The two Victoria companies, the Foundation Company and the Cholberg shipyard, have announced plans for community shipbuilding schemes backed by private capital publicly subscribed by the citizens of Victoria, the shipyard workers and the companies themselves. The Foundation Company has proposed to build twenty more wooden steamers and to raise at the outset a capital of $2,000,000. The cost of each vessel would be in the neighborhood of half a million. More than one thousand employees of the yard, it is said, have expressed willingness to take stock. The Cholberg yard scheme involves the construction of an indefinite number of wooden schooners for the lumber carrying trade. The capital of the ship owning company would be fixed at $670,000. The Victoria Board of Trade has appointed a committee to go fully into the matter and before any definite action is taken it will be ascertained to what extent Vancouver Island's manufacturers are prepared to support the enterprises.

Steel shipbuilding on a community enterprise basis is also under consideration. If adopted, this would probably involve the remodelling of the Foundation Company's plant or an extension of the Harbor Marine Company's yards, where two steel ships of 8,100 tons are under construction for the Dominion Government.

While Federal Government engineers are continuing preliminary borings at the Esquimalt harbor site of the big Dominion dry dock, Vancouver interests are ready to support the building of a dry dock in that port under the terms of the Dockyard Subsidy Act. Sir Henry Drayton, Minister of Finance, has been persuaded, according to reports, that a dry dock in Vancouver is a genuine necessity, but he has stated his intention of making no decision until the Victory Loan campaign is over. Coughlan & Co., Vancouver's big steel shipyard, has offered to accept the job and do its own financing, waiting for the subsidy until the plant is completed. For that reason it is said the Coughlan company will probably be favored by the Government when a decision is finally made.

A direct steamship service between Vancouver, Marseilles and Genoa will shortly be inaugurated, a contract having been signed recently by Count Fayolle, of Paris; J. J. Norton, of the Norton-Lilly Company, New York, and W. J. Edwards, representative of the Norton-Lilly Company in San Francisco, and H. A. Stevenson, Pacific coast manager of Dingwall, Cotts & Company, calling for a monthly service between the three ports mentioned, and handling through bills of lading to any port on the Mediterranean as far as the Black Sea. The company name is Societe Generale de Transports Maritimes a Vapeur, and the first steamer will arrive in Vancouver to load October 20. This is the steamer Mont Cenis, a 4,900-ton vessel.

The Victoria Metal Trades Council has presented the management of the Harbor Marine Steel Shipbuilding Company a tentative draft of a new wage scale which it requests be enforced. The council also urges the company to maintain a closed shop. At present the open-shop policy is in effect and the same rate of wages as prevails in the mainland shipyards prevail. The management has given no reply to the request so far.

The demountable lumber ship scheme, originated by John Arbuthnot of Victoria, is to be given a try-out in Seattle. J. H. Price, formerly engaged in the wooden shipbuilding business with the Cameron-Genoa Mills Shipbuilders, Ltd., in Victoria, announced a few days ago that he intends to proceed at once with building operations to be financed by powerful Canadian banking interests, and Mr. Arbuthnot has gone to New York to negotiate for the building of a fleet of twenty demountable craft on the Pacific coast. It is estimated that each vessel—roughly, they are simply great lumber rafts shaped like schooners, with "kicker" type engines installed at the stern and schooner-rig sails—will accommodate 5,000,000 feet of lumber, valued at approximately $250,000 on Puget Sound, but double that figure on arrival in the United Kingdom, where all the vessels will be sent. The lumber will be exported through the Furber Lumber Company, an English concern, backed by Vickers and Mexican Eagle Oil capital.

Baron Rempei Kondo, president of the Nippon Yusen Kaisha, Japan's premier shipping company, who was one of that country's special representatives at the Versailles conference, passed through Victoria a few days ago on his way back to the Orient. Shareholders of the N.Y.K. have renewed the movement to get the management to dispose of the special reserve funds held by the company. Among other reserves, the company has over $25,000,000 as a reserve against accidents and other contingencies due to the war. Some shareholders advocate the distribution of this reserve as extra dividends, while others would prefer to see it go towards the expansion of the company's operations.

Dispatches from Nome, Alaska, tell of the wrecking of the famous schooner Casco on King Island, about forty miles from Nome, during a southeast gale. The Casco was once the property of Robert Louis Stevenson, the novelist, and many of his stories were woven around the craft. While the vessel is now in a precarious condition, it is expected that she will be salvaged. She was bound for the Kolyma River section of Siberia on a gold hunting expedition.

The wooden auxiliary schooner Laurel Whalen seems to be pursued by misfortune wherever she goes. She reached Papeete, in the Tahiti group, a short time ago, with the cylinder heads of her

engines blown off, her sails in shreds, decks dismantled and flooded with congealed tallow, which had flown from the barrels stowed away in the hold. A heavy gale which she encountered three weeks before reaching Papeete battered the cargo and virtually disabled the ship. To cap the climax, the master, Capt. Hugh Dogherty, was laid up with a broken ankle, and the wheat cargo was full of weevils. The Laurel Whalen was built two years ago at Victoria.

Harold S. Cove, for seven years representative in Victoria for the firm of Balfour, Guthrie & Company, agents for the Harrison Direct Line, has been transferred to the company's Vancouver office.

Mr. Norman A. Yarrow, manager of Yarrows, Ltd., Esquimalt, has offered a prize of $50,000 for the first non-stop aerial flight from Victoria to Japan. The terms of the offer include the provision that the flier must be a Canadian and that the machine used must be the lighter-than-air or dirigible type.

MONTREAL MARITIME

FOLLOWING the congested condition of docks and shipping and the uncertain movement of vessels, as incidental to the recent railway strike and dock troubles on the other side, the normal resumption of shipping activities is again coming to the front. The port of Montreal, toward the last week of the month, began to realize the immediate aftermath of a marine tie-up, when vessels began to come in so fast that the facilities of the port were often taxed to the utmost. Of late, the sheds here have often been quite crowded with goods and materials waiting the arrival of ocean boats for shipment. Grain, flour and lumber, are three of the most common articles going into the holds of outgoing vessels. Grain elevators have seldom been taxed as they have been during the past month, frequently being filled to capacity while waiting the arrival of ocean steamers.

The manner in which the ocean vessels are now coming in promises a busy period for the remainder of the season. Many boats of the United States Shipping Board are still coming down the lakes, and as rapidly as they arrive they are given the final overhauling and loaded for their different destinations.

The improvements and extensions, being carried on by the Harbor Commissioners, are making good progress. The laying of the tracks to facilitate yard conditions and minimize freight congestion, is well on the way to completion, the tracks being all laid with the exception of grading, and final paving, as considerable space on Commissioners street has been taken over for this purpose.

In the last Saturday in September the cargo steamer "Alsace" was launched from the yard of the Canadian Vickers, Limited. The vessel was first consecrated by the French clergy here, and the ribbon was then cut by Madame Begard, wife of Capt. L. Begard, the representative of Cire Francaise d'Armement d'Importation de Nitrate de Soude, of Paris, France, for which company the vessel was built. The boat is a single screw steamer of approximately 8,400 tons and will have a speed of about 11 knots. She has a length of 400 feet, 52 feet beam and a depth of 31 feet. She is especially designed for the nitrate trade from Chili to France, and is fully up to the requirements of the France Board of Trade and Lloyds 100-AE classification. The vessel is just about completed and will shortly take on a cargo for France.

Another successful launching of one of the fleet of boats that is being constructed for the Canadian Government, was made at noon of October the 18th., when the "Canadian Navigator" a cargo vessel of 4,350 tons deadweight capacity, was placed in the water. This latest addition to the Canadian Merchant Marine is a vessel 320 feet in length, with a beam of 44 feet and a depth of 25 feet. After fitting out she will take on a cargo from this port for Liverpool. Several other large vessels are under construction at this yard and it is anticipated that at least two of these will take the water before the closing of navigation. It is very likely that such vessels will be taken to Quebec before the setting in of the cold weather, so that they can be fitted out at the Davis yard and placed in service this winter.

Toward the latter part of September the plant of the Canadian Vickers Company was the scene of a serious accident in the nature of an explosion of an acetylene tank that had in some manner come in contact with an open fire and overheated, causing a heavy explosion that seriously injured quite a number of the workmen, one of whom died shortly afterwards. Considerable damage was also done to the adjoining buildings.

If present plans materialize the amateur athletes among the employees of the Canadian Vickers Company of Montreal, will organize and construct a large club house that will be provided with all the modern conveniences for the comfort of the members. It is expected that a location close to the works will be secured.

The War Racoon, built at the Polson Iron Works, Toronto, is now in port, and after some light repairs at the hull, which will be carried out in the Vickers drydock, she will take on a cargo of lumber. This vessel is owned by Tyzack and Brantfoot, of Newcastle-on-Tyne.

Another vessel now in port is the New Toronto, of the Elder-Dempster South African service. She was built at the Harland and Wolff yard at Belfast, and left there on her maiden voyage on the 9th of October. She is taking on a general cargo for Capetown and will sail about November the 5th.

British Government tonnage requirements are gradually being reduced and the Canadian Trade Mission has been advised that the present requisition of forty per cent. of cargo space will be reduced every month, so that by the spring of next year, the general trading conditions will probably be of normal character.

During the visit of the Prince of Wales to the City of Montreal, he will be the guest of the Harbor Commissioners for several hours, taking a trip along the entire water front, and will land at Victoria pier to lay the corner stone of the Seamen's Memorial, which will be erected in honor of the men of the Merchant Marine who fell in the war. It has been decided to decorate the entire harbor and the vessels that may happen to be in port at that time.

The Fraser Brace Shipyards are busily engaged in the final fitting out of the eight boats that they had under construction for the French Government. Trial trips have been made on several of these and it is expected that the entire eight will be handed over to the owners before the middle of November. Operations are also in progress in the further excavation of the drydock to carry on repair work in connection with vessels operating on the Great Lakes. They will probably be in a position to take in vessels about the first of November.

Montreal has a visitor at present in the person of Alex. Livventaal, late consulting engineer to Sir William Armstrong, London, and who acted in the same capacity in former years, to Count Zeppelin. He is an advocate—and hopes to demonstrate the possibilities—of the log ship for the transport of lumber overseas. He believes that one of these vessels can be built to carry 1,500 standards of lumber, and that these vessels can be constructed at a cost of approximately $35 per standard. A captain and crew of about 12 men would be ample for the navigation of the "vessel."

During a recent stay of the steamer "Corsican" in the port of Montreal, a test was made of a new apparatus designed to facilitate the lowering of life boats from a vessel at sea. The device is a simple attachment of skids placed over the ordinary life boat, and it was demonstrated that no matter what the angle of the vessel's list, the presence of these skids would permit the lowering of the boats with perfect ease and safety. The appliance was constructed by Mr. Hylands of New York, and is already in use by the United States Navy and the United States Shipping Board.

Victoria.—Powerful Canadian interests are behind a movement to secure the building of twenty more wooden ships in Victoria. John Arbuthnot of this city has gone to New York to negotiate the business there. Each ship would require between 5,000,000 and 6,000,000 feet of lumber.

Moulding Hawse Pipes, Alternative Methods

If the Reader Will Carefully Compare the Story With the Drawings at Each Stage, He Will See Many Interesting Points of General Use

By JOHN H. EASTHAM

IF you are producing castings for the standard fabricated type of ship now being turned out of many American yards, with straight sides, sheer from a flat bottom to the forecastle deck, you may possibly get good results from a permanent standard hawse pipe pattern, or pair of patterns, pitched to suit port or starboard elevations, direct from the blue print, but should "camber" and "dead rise" control the pitch of your castings, as they inevitably must in all moulded hulls, you are entertaining a vastly different proposition.

As may readily be seen from the forward and starboard sectional views of Figs. 1 and 2, the pitch of the pipe at junction with the line chock at the forecastle deck, as well as at the out-

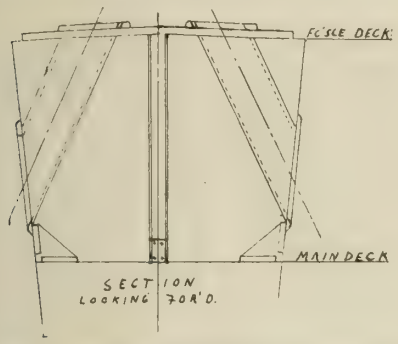


FIG. 1—SHOWING SECTION LOOKING FORWARD.

side flange, is best determined by the use of a light wooden template—corresponding to the view of the pipe as seen in Fig. 1.

As this template is usually made by the pattern department a week or so before the date of launching, the pattern alterations being next in order, the job is usually in the "rush" category by the time it reaches the foundry, the rapid production necessary, coupled with accuracy, being perhaps best obtained by the pit and drawback method hereafter described.

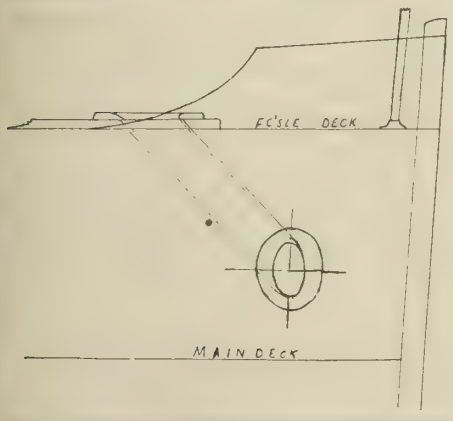


FIG. 2—SHOWS STARBOARD SECTION VIEW.

An ordinary dowelled split pipe pattern of whatever diameter ordered, for example as in this case, sixteen inches inside, is made with a plain open end and coreprint at one end, and a flat blank end of outside pipe size at the end intended to be flanged, the flange being afterwards screwed to position, being backed up by "V" filling pieces to suit the template above mentioned, one half flange being attached to the drag pattern, and the other to the cope half, or the full circle screwed to the drag pattern to ensure rigidity. The drag half pattern is bedded into a pit, an iron bearing under the core print at the plain, or deck end, and a chaplet bearing at a suitable distance from the flanged end, the pit being then rammed up to the joint, boards being packed up outside the flange whilst ramming, then removed and the undercut parting made linable with the inside or back face of the flange. This undercut parting is next lined up with wet parting sand, sleeked, and the area in front of the flange levelled off to receive drawback box shown in cross section at Fig. 3, and in perspective at Fig. 4.

A brief description of this drawback and its economical manufacture may be in order at this juncture, by way of soothing the qualms of those foundrymen who do not care to risk much in the way of investment on rigging.

A three-sided frame of pine or other suitable lumber, open at top and bottom, is made, sloped at its open end to suit the pitch of the pipe flange, one of its sides being made longer than other for the same reason, the frame being screwed up so as to be easily reversible, thus making a pattern of right or left hand type to suit starboard or port pipe requirements. A hole is dug of the drawback's full depth, sufficient room being allowed all round for comfortable working, a bed being then struck off level, the frame being next laid on the bed, rammed up about half way inside and out, even ramming being necessary to avoid bulging or warping the pattern. Stakes as shown at Fig. 5 being now driven down in the inside a couple of inches from the pattern, the tops of the stakes being driven down to an inch or so below the face of the finished core.

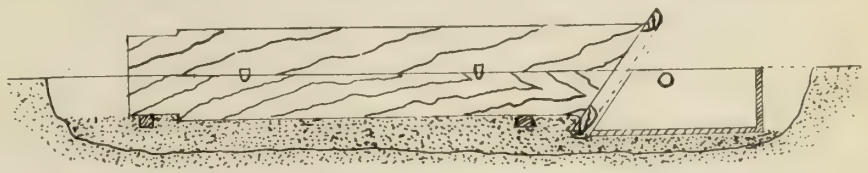


FIG. 3—SHOWS PATTERN DRAW-BACK BEDDED IN.

A cinder bed is next spread over the inside to facilitate venting, with the usual vent-pipe as shown, the remaining filling and ramming being then completed, the upper face being afterwards strickled out and a runner of open sand type made up prior to the pattern being drawn. The three lifting holes may be either cored or afterwards drilled, as desired.

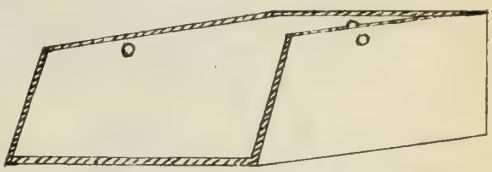


FIG. 4—PERSPECTIVE VIEW OF DRAW-BACK.

The drawback is lowered in front of and almost touching the front face of the pattern flange, the upper half of the pipe pattern being then placed in position, the area outside the drawback box being next rammed up to the pipe parting level, whilst the inside is carefully

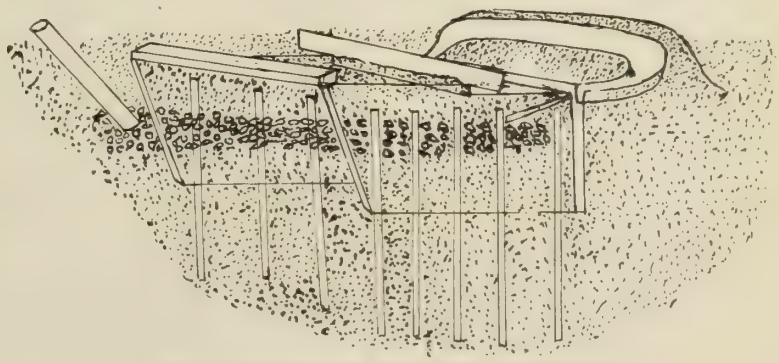


FIG. 5—METHOD OF MOULDING DRAWBACK.

rammed up and reinforced by loose irons wherever sand projections are likely to occur, "humped" up to follow the shape of the flange from the upper edge of the box, wet parting sand or paper being then spread over the hump.

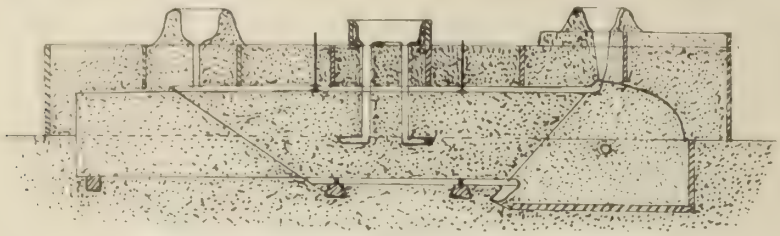


FIG. 6—CROSS SECTION OF ASSEMBLED MOLD.

The cape flask is now lowered to place, and rammed up in the usual way, with gate and riser pins in position, the flange riser being of fairly heavy design to allow shrinkage replacement.

While opinions vary somewhat on this point, the writer has found the practice of ramming up the chaplets in the cope a fairly good one, a perpendicular position for them being thus easier attained than by pushing them through afterwards. Guide stakes having been driven at each corner or staking piece, the cope is hoisted off and taken away, the upper half of the pattern coming with it, a pair of eyebolts screwed into rapping plates holding it to position till the cope is rolled over to its desired attitude for finishing, about a shovel width of sand being then dug away from the three

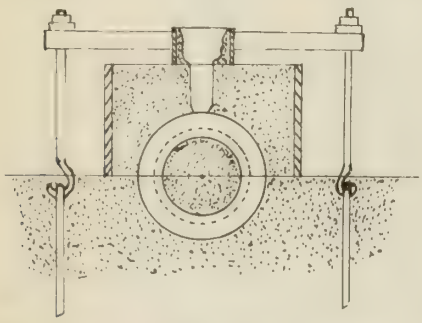


FIG. 7—END VIEW SHOWING METHOD OF BINDING MOLD.

sides of the drawback to its extreme depth, three chains on three turnbuckle lifters being next hooked to the box by the holes provided for the purpose, the drawback being eased up from its bed a fraction of an inch, and "drawn back" clear of the flange and bell mouthed opening at the end of the pattern, then hoisted clear of the hole and set down on wood blocks or a soft sand bed to be finished. That duty performed, on cope and drag parts as well as the drawback, a coat of blacking is applied to all three, and in most shops a molasses water wash, followed by a blaze from a torch dryer, the fairly heavy section and undercut type of mould making this advisable, the drawback is next lowered to position again, but the cut-away space behind the box should never be rammed up before the core has been tried in and finally set, as in case of a possible crush during these proceedings much extra labor would be entailed.

The cope flask is now tried on, and after inspection finally closed, runners and risers built up, and the whole fastened down by weights or pit binders, cross-section and end views of the assembled mould, with method of binding being shown at Figs. 6 and 7 respectively.

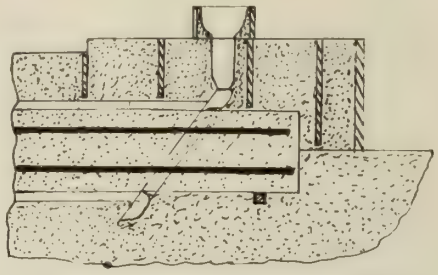


FIG. 8—SHOWING ALTERNATIVE SYSTEM OF "DRAWING" FLANGES

Incidentally the alteration at the plain end of the mould, from a rectangular end to the required pitch, is handled by stopping-off pieces matching the template, placed in the cope and drag halves after removing the patterns, as in ordinary pipe practice, the joint in both cases being marked to correct length, plus the usual contraction allowance, this detail, as well as the "humped" joint line in the drawback being very plainly shown in Fig. 6.

Fig. 8 shows an alternative method of moulding hawse pipes, the flanges being drawn inward in this case, the core carried right through, and the drawback abolished, a method which at first sight appears very economical, but which in actual practice is unsafe, the "feather-edged" mould set up at the flanged end inside the bell-mouthed opening being impossible to handle correctly, crushes with their consequent dirt and malformation being the principal objection and owing to the increased chipping to shape

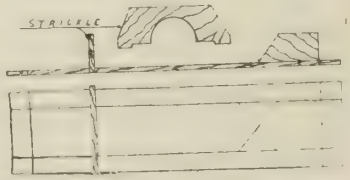


FIG. 9—SHOWS SIMPLE COREMAKING RIGGING

when cleaning the casting, an unsightly bell mouth is the result, consequently the practice has nothing to commend it, save that in the case of a single break-down order it might serve, much paint usually being employed to partially cover a multitude of sins. Obviously, as a medium course between the "drawn-in" method just mentioned, and the drawback box system before described, it is possible to use a flat plate drawback with perfectly satisfactory results, but if you are going to make castings of this description in quantities a little extra initial outlay will very soon come back in the way of reduced ultimate cost. The coremaking is usually handled on a similar system to that practised in the mould, a larger core box of sufficient length can be lined to reduce its diameter to correct dimensions, or a plain frame and strickle employed, stop-off blocks marked "cope" and "drag" respectively, being rammed up in the frame as shown at Fig. 9. Great care being observed in jointing the two halves after drying and correct pitch being maintained, will reduce the moulder's troubles considerably and abolish the fin likely to be left at the junction of the core and drawback in the event of an overlapped or broken end due to careless coremaking.

MACHINERY EXHIBITION

The Merchants' and Manufacturers' Exchange of New York are announcing the holding of an International Machinery Exposition in the Grand Central Palace, New York City. This is to be one of the most advanced steps made in the machinery industry since the close of the war, and will be a permanent affair. October 15 is scheduled as the opening date, at which time it is expected that hundreds of machines will be in actual operation. Mr. Lloyd L. Warfield is manager of the Machinery Exposition. Mr. Fred W. Payne is general manager of the Merchants' and Manufacturers' Exchange, and has general supervision of all of the expositions. Inquiries should be addressed, prior to Sept. 15, to Suite 421, 405 Lexington Ave., New York City, and after that date to Grand Central Palace.

BOLSHEVIK DEFINITIONS

Capitalist—A citizen of better standing in the community than yourself.

Martyr—Anyone who has been shot in an argument.

Torch of Freedom—Any instrument by which a fire may be started.

Tyrant—A person in whose mind pay is unalterably associated with work.

Soviet—An organization of which all the members are president and treasurer.

Medievalist—An extraordinary individual who still considers family ties binding, debts payable, and that a man should work for his living.—Life.

To find the weight of a ball, multiply the cube of its diameter by .5236, which gives its solid contents, after which, if it is to be of cast iron, multiply by .26.

Some Hints on the Care of Pneumatic Tools

A Talk on the Various Conditions Under Which Pneumatic Tools Are Used, with Suggestions as How Best to Meet These Conditions

THERE are few modern machines of such importance, considering weight and size, as the pneumatic tool, more particularly in connection with shipbuilding. Considering the conditions under which the average pneumatic tool is operated, in all temperatures, exposed to unfavorable weather conditions in outdoor work, or in dusty surroundings in machine shop and foundry, it is not surprising that care of the tool is well repaid by increased work and longer life.

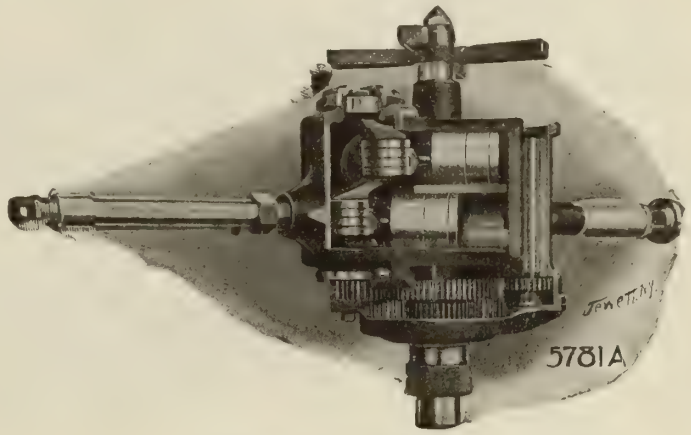
In the first place, whatever the tool, riveter, grinder, chipper, drill, etc., the air supplied must be as clean and dry as possible.

The cleanliness of the air can be assured by having the intake for the compressor suitably placed; the dryness depends also on the compressor. In two-stage air compression, a large percentage of the moisture contained in the air is removed by a moisture trap in the intercooler. For large installations, it is well worth while to supplement the intercooler moisture trap by an aftercooler, in which the air is again cooled after the final compression, and still moisture removed. The Hog Island Shipyard compressed air installation is the second largest in the world; all the air is compressed in large two-stage machines, and passed through aftercoolers.

The main difficulty due to moist air comes in cold weather; air exhausting from pneumatic tools is very cold in any case, due to expansion, and the cooler the air the less moisture will it hold, the result being that in cold weather the exhaust of the tool rapidly becomes clogged with ice deposited from the air, unless means are taken to prevent this happening. Still another preventive is to have a reheater in which the air is heated just before reaching the tool; the air is then too warm to deposit the moisture in the form of ice, and the reheater has the further advantage of expanding the air, increasing the supply to the tool. It seems at first rather absurd to cool the air after leaving the compressor only to heat it before reaching the tool; the point is that the air would cool anyway, and it is better to catch the moisture in the aftercooler trap, than to have it deposited in the pipe line. Marble cutters who use the small carving pneumatic tools sometimes in the winter put a lubricator filled with alcohol on the discharge line and allow it to feed with the air and this prevents freezing, but the quantity has to be carefully gauged.

Good lubrication is the secret of good performance for pneumatic tools as for other machines. Riveters, chippers, and other reciprocating tools require a light bodied oil of high grade, and should be oiled three or four times a day. Drills, etc., should be packed with a grease that is not too light—if it is too light it will cause heating—and do not require attention so often as riveters and chippers. They should, however, be turned over frequently to allow the grease to reach all working parts. Grinders, close corner drills, etc., sometimes use 600 w. steam cylinder oil with excellent results on a mixture of grease and 600 oil.

Pneumatic tools of all kinds should be cleaned once a week. Riveters, etc., should be taken apart and cleaned in a bath of kerosene. For drills and grinders it is sufficient to pour in kerosene, run the machine light for a few minutes, drain out the kerosene, and fill with grease.



SECTIONAL VIEW OF PNEUMATIC TOOL.

In case of trouble with valves, etc. the less tinkering the better. The pneumatic tool is made up of parts of selected material, generally high grade steel, heat-treated and ground to close limits, and a very little filing will usually do a great deal of harm. For the same reason home-made substitutes for parts that need replacement are decidedly false economy.

In cold weather on outside work, a useful tip is to warm the tool slightly before starting work.

BRITISH PORTS

Figures are to hand of the Board of Trade returns of the values of goods imported and exported at the principal ports in the United Kingdom during the years 1917 and 1918. These show that the total trade of the United Kingdom was in 1917, £1,660,921,000 and in 1918 it had increased 11.3 per cent. to £1,848,549,000. Liverpool now stands first in the list with a total trade in 1918 of £683,007,000; London is second (she was first until the war diverted much of her trade to other ports) with £541,905,000, having gained 7 per cent. over her trade of 1917. Liverpool's increase was 14.4 per cent. Manchester is in third place with trade to the value of £107,082,000 in 1918, showing an increase of 20.9 per cent. over 1917 figures. The port of Manchester was opened for traffic in January, 1894, and her great progress has shown the need of the port to the district, and justified the expenditure of £17,000,000 which is the cost of the ship canal and docks.

Glasgow is the fourth port with a trade value of £96,565,000, her increase over 1917 being 25.3 per cent. Hull is next with a value of £90,398,000. The war has also been responsible for a falling off in the trade of this port, its situation on the east coast putting it close to the war zone. Southampton is next on the list with a trade value of £39,715,000. This port was closed entirely for commercial business during the war, and some time will be needed before it regains its former normal trade.

U. S. NAVY SELL VESSELS

The United States Navy Department is offering a large number of obsolete vessels for sale. They include various classes, such as submarine chasers, coal burning destroyers, cruisers, yachts, motor boats, trawlers, tug boats, monitors, and gunboats. The vessels will be sold to the highest bidders, and the necessary forms and particulars can be obtained from the Navy Department, Washington, D. C.

Chas. Cory & Sons, of 290 Hudson street, New York, N.Y., manufacturers of marine electrical appliances of all kinds, have opened a branch at 207 Market street, Philadelphia.

Victoria.—An attempt at forming a co-operative shipyard is being made by the Cholberg Shipyards of this city. The shares will be held by the public, the workmen and the company, and the business carried on would be the building of wooden vessels to operate in the lumber trade of the Pacific coast.

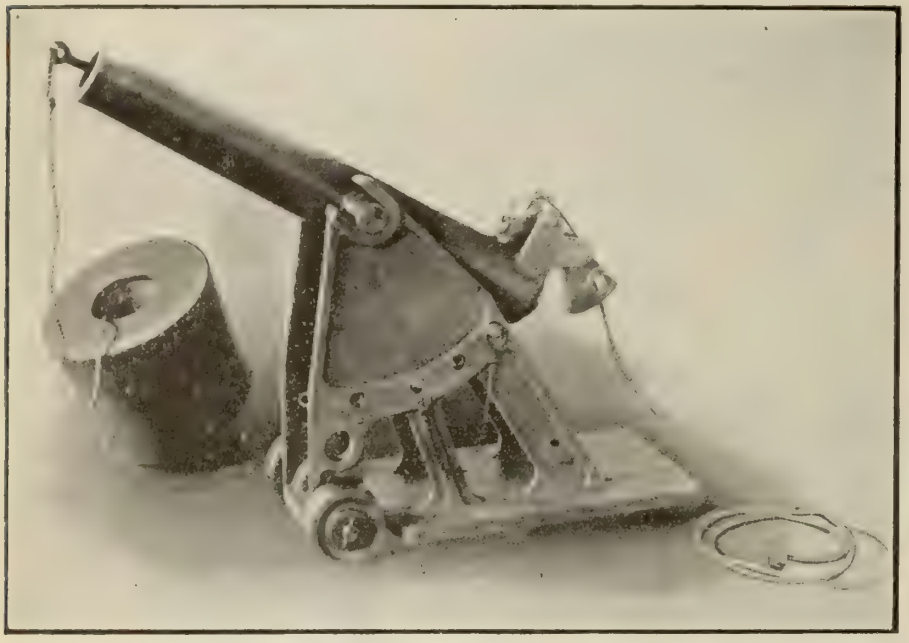
PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

NEW LIFE-SAVING GUN

In a series of recent tests made for the United States Steamship Inspection Board, the new G-O Life Line Gun for throwing life-lines met every one of the requirements established by the board, and greatly exceeded the great majority of them.

Unlike most of the guns now in use at life saving stations and on shipboard, the G-O gun requires no separate powder charge, wad or primer. The charge and projectile are one piece, thus eliminating the danger of moisture getting to the powder.



LINE THROWING GUN.

In one of the tests recently made the cartridge case was immersed in water and then put into the gun and fired. In another, the barrel of the gun was filled with water, the cartridge inserted and successfully fired through the water, proving that any amount of moisture could not damage the cartridge or mechanism in any way.

In none of the tests to which the gun was put was there a misfire or short shot. In every case the projectile went well beyond the mark, without the breaking of a single line.

The one big feature of this new gun is, that it is a one-piece ammunition powder charge and projectile. Contrast this with the present type guns which must be loaded with the powder charge and wads rammed into the barrel—much the same as the old-fashioned muzzle-loaders. In case of a misfire, great time is lost in preparing the gun for a new charge.

The recoil was found to be perceptibly less than any other gun of like character. The teeth on the bottom of the bottom of the gun carriage held the gun firmly in place during all of the tests.

The gun is made in two parts, the carriage and the barrel are so constructed that it can be easily and quickly moved from one part of the boat to another and the barrel can easily be carried by one man. The wheels in front of the carriage allow it to be moved easily in any position required. Tests were carried out at each of the gun's four elevations—30, 45, 60 and 80 degrees.

The Board's officials commented particularly on the simplicity of the gun and the ease with which anyone, even though unfamiliar with its operation, could handle it. Another point which came in for commendation was the length of the life line, which permits of accurate shooting at objects 1,700 feet distant.

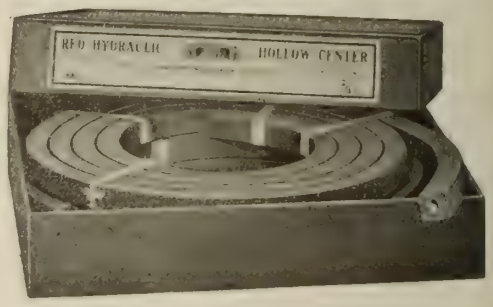
When a cartridge is inserted in the barrel, the life-line is attached to the projectile. A slight pull on the lanyard fires the cartridge and the line uncoils from its container without possibility of snarls or breakage.

The gun is manufactured by the General Ordnance Company which designed and built the famous "Y" depth bomb guns used during the war on the United States army transports and on the navy's torpedo boats, destroyers and submarine chasers. It also designed and manufactured the non-recoil airplane guns for attacking submarines—the only heavy artillery ever mounted on an airplane.

In addition to its ordnance work, it is at present engaged in manufacturing the G-O Farm Tractor, its plants at Derby, Conn., and Cedar Rapids, Iowa, being two of the best equipped plants for this purpose in America.

OVALHOLE PACKING

A new packing has been developed for the circumventing of the many piston packing troubles common to the engine room. It is often a difficult matter to keep steam from blowing past the packing in cases where rods are worn out of round. To obviate this difficulty, the Hollow Center Packing Co., Cleveland, developed the packing shown in the accompanying illustration.



OVALHOLE HYDRAULIC PACKING.

The hole is oval shaped so that the packing is flexible and when put under strain by tightening the gland, it readily expands to compensate for irregularities. Another feature, it is pointed out, is the fact that the hollow construction gives



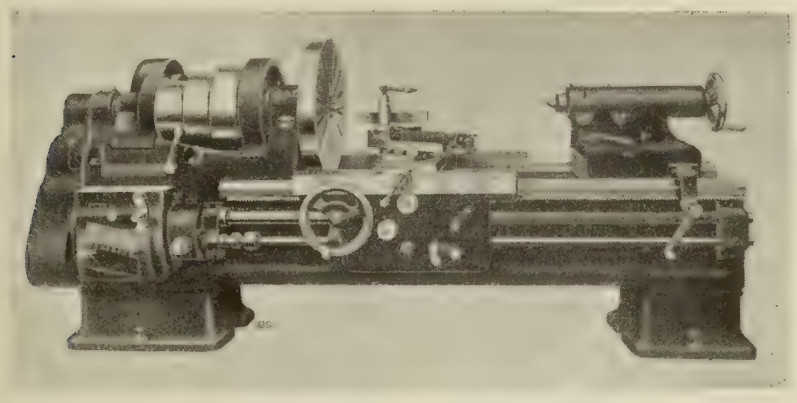
OVALHOLE REGULAR PACKING.



HIGH PRESSURE STEAM PACKING.

the packing comparatively long life, due to the fact that as the action of the rod wears the packing away, setting up the gland elongates the packing rings, making them fill the gland completely. It is said that the hollow design also eliminates undue friction which is apt to score the rod.

This material is made in three different grades; one for ordinary use, with steam at pressures up to 125 pounds, one for inside packed pumps and hydraulic service, and another high-pressure superheated steam. This latter is constructed of the highest grade heat-resisting material impregnated with a springy heat-resisting rubber compound vulcanized to withstand high temperatures.



Front bearing, 4½ in. x 7¾ in.; back bearing, 3⅜ in. x 5⅜ in.; width of belt, 5½ in.; hole through spindle, 2⅛ in., cutting tool size, ⅞ in. x 1¾ in.; diameter nose of spindle, 4 in.; diameter of tailstock spindle, 3⅜ in.; length of carriage bearing on bed, 36 in.; ratio of back gears, 12¼ and 3 3-5 to 1; diameter of countershaft pulleys, 16 in. x 5½ in.; speed of countershaft, 185 to 225 r.p.m.; lengths of bed, 10 ft. to 30 ft.; distance between centers, 10-ft. bed, 60 in.; weight (net) 10-ft. lathe, 7,100 lb.; weight per extra 2 ft., 520 lbs.

CINCINNATI 28-INCH SEVERE-DUTY LATHE

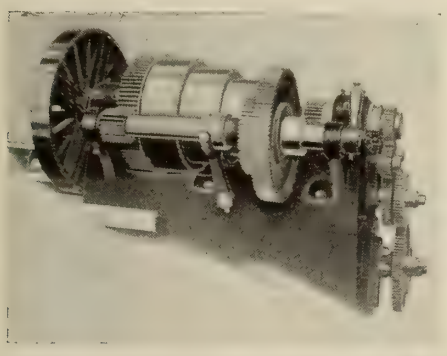
In Fig. 1 is shown a general view of the 28-in. "severe duty" lathe built by the Cincinnati Lathe and Tool Co., Cincinnati, Ohio. This machine is a larger edition of the 15- and 16-in. lathes manufactured by the same company for the last 15 years and includes the same features. Designed for heavy duty, the construction is neither complicated nor such as to make the parts cumbersome to handle. Fig. 2 shows the sliding double back gears from the rear.

The bed is 18¼ in. in depth and 23⅛ in. wide and is heavily braced with box-section girders to minimize twisting strains. Bed lengths from 10 to 30 ft. can be supplied, each size being 2 ft. longer than the preceding one. The cabinet legs are provided with two screws in the centre of each so that each end may be regulated to make the bed perfectly true. This arrangement makes wedges unnecessary.

The equipment supplied with the lathe includes the cabinet legs, a box-type apron, a chasing dial, an automatic stop, plain or compound rest, large and small faceplates, a steadyrest, a self-oiling two-speed friction pulley countershaft, a quick-change gear box giving a wide range of threads and feeds and the necessary wrenches.

The following extra equipment can be furnished: turrets on carriage or bed, oil pan and pump, taper, relieving and draw-in attachments, chucks, etc. This machine may also be obtained with geared head for belt or motor drive.

Above are the principal specifications.



SLIDING DOUBLE BACK GEARS AS SEEN FROM REAR

Mr. Armstrong, M.P., has again before the house this session his bill to amend the Railway Act so as to bring steamship companies under its operation. When this bill was up last session a summary was given of its provisions, and the history of the attempt to have it pass through Parliament. While the Industrial Conference was on here a number of Western business men, including James Ashdown of Winnipeg, and Henry Detchon of the Canadian Credit Men's Association, met a number of the Western members of Parliament and discussed the bill and its objects. They came to the conclusion that they could not see any serious objection to the legislation, and advised Mr. Armstrong to go out to Winnipeg and address the business men there at a meeting of the Board of Trade, which was held on October 2nd.

Generally speaking, Western men are in favor of the bill, and supported it in the House last session, but would like to have information regarding it disseminated, as those opposing it have been adopting this course. The bill has had its first reading in the House; and while its supporters do not except to see it go through this session, they hope that it will next year.—T. M. F.

CATALOGUES

The Main Belting Company of Canada, with head offices at 10 St. Peter St., Montreal, has just issued a new "Book on Belting." This is not in the form of a catalogue, but is more for the purpose of advising and instructing the engineers and the users of belting, as to the proper method of using Leviathan and Anaconda belting under varying service. The pages are profusely illustrated with views of Main belting installations under every conceivable range of service. Many line drawings are used to illustrate the proper arrangement of pulleys and belts in conveyor systems, so that the maximum efficiency will be attained and the life of the belt extended. Many points, incidental to power transmission, are thoroughly treated in this volume, and by the use of rules, tables, and charts, the book is practically an engineers' text-book on every form of power transmission problem. The volume is made up of 144 pages of loose leaf formation, so that additions can be easily made from time to time. The book is one that should be in the possession of every engineer.

Iron and Steel, by Erik Oberg and Franklin D. Jones. The Industrial Press, New York. Steel having almost any desired physical characteristics may now be obtained and great progress has been made in the making of iron and steel castings, but these products of the steel maker and metallurgist have not always been used to advantage by the designer and manufacturer. Expensive materials are often employed where cheaper grades would meet every requirement, or this order may be reversed and low-grade materials be used where the best would prove economical and necessary. Because of these facts, the relation between the different grades and qualities of iron and steel and the particular use for which each kind is adapted are emphasized in this book.

As the transformation of crude iron ore into various classes or grades of iron and steel requires the knowledge of the chemist, the experience and skill of the iron and steel maker, and a great variety of mechanical and electrical equipment for the various processes, it is manifestly impossible to cover the whole field. No attempt, therefore, has been made to compile a complete treatise for metallurgist and other specialists, but rather a text-book suitable for students in technical schools and those in the machine building and mechanical engineering fields who want a broad general survey of the iron and steel industry, with definite practical information pertaining to the various commercial forms and grades of iron and steel products, and the particular class of service for which the different grades are applicable.

The various refining and mechanical processes of the iron and steel industry have been described quite completely in some instances because of the close relationship between the manufacturing method and the characteristics of the product. The chapters dealing with iron ore and the making of pig iron are followed by others on wrought iron, structural steels, tool steels, alloy steels, cast iron, steel castings, and the methods of rolling and drawing bars, flat plates, shafting and wire. The treatment of these different subjects will be appreciated by designers of machinery or tools as well as manufacturers and workers in metal.

Canadian Government Ship Contracts

Contr't No.	Yard No.	Name	Firm	Type	D.W. Tonnage	Launching Date	Delivery Date
1	66	Can. Voyageur	Canadian Vickers Ltd.	Single Deck Poop, Bridge, F'cle.	4,300	Nov. 23, 1918	Jan. 22, 1919
2	67	Can. Pioneer	Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,100	Dec. 8, 1918	April 4, 1919
3	61	Can. Warrior	Collingwood S. Co.	Single Deck Poop, Bridge, F'cle.	3,750	Dec. 4, 1918	April 2, 1919
4	100	Can. Volunteer	Wallace Shipyards Ltd.	Single Deck Poop, Bridge, F'cle.	Lake Type 4,300	April 5, 1919	June 12, 1919
5	106	Can. Trooper	Wallace Shipyards Ltd.	Single Deck Poop, Bridge, F'cle.	4,300	May 31, 1919	Aug. 8, 1919
6	101	Can. Aviator	Wallace Shipyards Ltd.	Single Deck Poop, Bridge, F'cle.	5,100	Oct. 9, 1919	Nov., 1919
7	102	Can. Raider	Wallace Shipyards Ltd.	Single Deck Poop, Bridge, F'cle.	5,100	Nov., 1919	Dec., 1919
10	62	Can. Recruit	Collingwood S. Co.	Single Deck Poop, Bridge, F'cle.	3,750	May 3, 1919	June 7, 1919
11	63	Can. Signaller	Collingwood S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 3,750	June 29, 1919	Aug. 30, 1919
12	64	Can. Gunner	Collingwood S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 3,750	Oct. 4, 1919	Oct., 1919
13	5	Can. Settler	Tidewater S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 5,100	Sept. 20, 1919	Nov., 1919
14	6	Can. Rancher	Tidewater S. Co.	Single Deck Poop, Bridge, F'cle.	5,100	Oct., 1919	April, 1920
15	7	Can. Fisher	Tidewater S. Co.	Single Deck Poop, Bridge, F'cle.	5,100	April, 1920	May, 1920
16	8	Can. Forester	Tidewater S. Co.	Single Deck Poop, Bridge, F'cle.	5,100	April, 1920	June, 1920
17	459	Can. Trapper	Davie S. & R. Co.	Single Deck Poop, Bridge, F'cle.	5,100	Oct., 1920	Nov., 1919
18	460	Can. Hunter	Davie S. & R. Co.	Single Deck Poop, Bridge, F'cle.	5,100	April, 1919	May, 1920
19	39	Can. Trader	Port Arthur S. Co.	Single Deck Poop, Bridge, F'cle.	3,400	May 5, 1919	July 18, 1919
19a	41	Can. Adventurer	Port Arthur S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 3,400	Sept., 8, 1919	Oct., 1919
20	40	Can. Sailor	Port Arthur S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 3,400	May 31, 1919	Aug. 6, 1919
20a	42	Can. Sower	Port Arthur S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 3,400	Oct. 9, 1919	Nov., 1919
21	1	Can. Mariner	Halifax S. Ltd.	Two Deck Poop, Bridge, F'cle.	Lake Type 8,100	March, 1920	April, 1920
22	2	Can. Explorer	Halifax S. Ltd.	Two Deck Poop, Bridge, F'cle.	8,100	April, 1920	May, 1920
23	73	Can. Navigator	Canadian Vickers Ltd.	Sirgle Deck Poop, Bridge, F'cle.	4,300	Oct. 18, 1919	Nov., 1919
24	68	Can. Ranger	Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,100	Apr. 19, 1919	June 4, 1919
25	69	Can. Seigneur	Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,100	May 7, 1919	Aug. 14, 1919
26	70	Can. Miller	Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,100	Aug. 16, 1919	Sept. 24, 1919
27	71	Can. Spinner	Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,100	Nov., 1919	Dec., 1919
28	72	Can. Planter	Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,100	Nov., 1919	Dec., 1919
29	1	Can. Armourer	Victoria Machinery Depot Co.	Two Deck Poop, Bridge, F'cle.	8,100	Feb., 1920	April, 1920
30	2	Can. Composer	Victoria Machinery Depot Co.	Two Deck Poop, Bridge, F'cle.	8,100	March, 1920	May, 1920
31	15	Can. Beaver	Collingwood S. Co.	Single Deck Poop, Bridge, F'cle.	3,750	Nov., 1919	May, 1920
32	43	Can. Runner	Port Arthur S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 4,350	March, 1920	June, 1920
33	44	Can. Carrier	Port Arthur S. Co.	Single Deck Poop, Bridge, F'cle.	4,350	March, 1920	June, 1920
34	11	Can. Importer	J. Coughlan & Sons.	Two Deck Poop, Bridge, F'cle.	8,100	Nov., 1919	Dec., 1919
35	12	Can. Exporter	J. Coughlan & Sons.	Two Deck Poop, Bridge, F'cle.	8,100	Dec., 1919	Jan., 1920
36	13	Can. Inventor	J. Coughlan & Sons.	Two Deck Poop, Bridge, F'cle.	8,100	Dec., 1919	Feb., 1920
37	14	Can. Prospector	J. Coughlan & Sons.	Two Deck Poop, Bridge, F'cle.	8,100	Jan., 1920	March, 1920
38	3	Can. Cruiser	Halifax S. Ltd.	Three Deck Poop, Bridge, F'cle.	10,500	Oct., 1920	Dec., 1920
39	4	Can. Constructor	Halifax S. Ltd.	Three Deck Poop, Bridge, F'cle.	10,500	Oct., 1920	Dec., 1920
40	5	Can. Sealer	Nova Scotia S. & C. Co.	Single Deck Poop, Bridge, F'cle.	2,800	Oct. 9, 1919	Dec., 1919
41	6	Can. Miner	Nova Scotia S. & C. Co.	Single Deck Poop, Bridge, F'cle.	2,800	March, 1920	May, 1920
42	1	Can. Reaper	Prince Rupert Co.	Two Deck Poop, Bridge, F'cle.	8,100	May, 1920	July, 1920
43	2	Can. Thrasher	Prince Rupert Co.	Two Deck Poop, Bridge, F'cle.	8,100	June, 1920	Aug., 1920
44	4	Can. Otter	British American S. Co.	Single Deck Poop, Bridge, F'cle.	4,350	April, 1920	June, 1920
45	5	Can. Squatter	British American S. Co.	Single Deck Poop, Bridge, F'cle.	4,350	April, 1920	July, 1920
46	65	Can. Farmer	Collingwood S. Co.	Single Deck Poop, Bridge, F'cle.	3,950	April, 1920	May, 1920
47	66	Can. Observer	Collingwood S. Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 3,950	April, 1920	June, 1920
48	10		Dominion Ship Co.	Single Deck Poop, Bridge, F'cle.	Lake Type 3,500	April, 1920	June, 1920
49	11		Dominion Ship Co.	Single Deck Poop, Bridge, F'cle.	3,500	April, 1920	June, 1920
50	77		Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,350	May, 1920	June, 1920
51	78		Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,350	June, 1920	Aug., 1920
52	79		Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,350	Sept., 1920	Oct., 1920
53	80		Canadian Vickers Ltd.	Two Deck Poop, Bridge, F'cle.	8,350	Oct., 1920	Nov., 1920

REMELTING CHILLED CASTINGS

A question which is frequently brought to light in the foundry is that of remelting chilled castings such as old car wheels or plow points, and it is truly laughable the views some people seem to take. I once worked in a foundry where the foreman would not allow water to be squirted under the cupola after dropping the bottom, because it would harden the iron which would be mixed with the cinders. I remember in that same shop a lot of small car wheels were being made for a mine or quarry of some kind, and they were chilled the same as a freight car wheel, although made from the same iron as was used for the other work. One of them spoiled, and the foreman was greatly incensed about it because, he said, it is not only the wages which are lost, but the metal also, because if we put that back into the cupola it will spoil the whole heat. I could hardly refrain from laughing, and I tried to explain to him that he took a wrong view, but I only annoyed him all the more, so I dropped the argument and I presume that he still thinks that he was right. Chilling a casting has no effect whatever in changing the chemical content of the metal, and if it was hard iron before being chilled it will be hard after remelting, but if it was soft iron before being chilled it will be soft after remelting.

Melted iron picks up carbon from the fuel up to a certain limit. This limit varies according to the silicon content of the iron. When the melted iron is poured into the mold, the longer it can be kept in a fluid state the more opportunity is given to the carbon to change from the combined to the graphite state, but if it is chilled at once, the carbon has no chance to change, and, as a consequence, the part which was chilled will be hard. Now, if this is remelted, because it already has its full quota, and if poured into ordinary work it will proceed in the ordinary way to change from the combined to the graphitic state just the same as it would have done had it never been chilled. To carry the point a little further and get down to fine points, the recast from the chilled casting would be slightly softer than that from an unchilled piece. For instance, take a sample of the hardest part of a chilled car wheel and a sample from the hub, and the rim will show the highest in silicon for the reason that silicon continues to leave the iron as long as it is in a melted state. And the silicon in the rim did not have the chance to escape which that in the hub had. Now, as we have said, the silicon regulates the amount of total carbon, hence the melted rim will not absorb so much carbon as the melted hub. It should not require much study to see that my argument is right, but a busy foreman may be excused for not thinking about it. We all know that chilling a cold chisel makes it hard and that reheating it brings it back to its original state. Certainly there is room for much study in the foundry, yet foundry work receives about the minimum of thought.

The Canadian Ingersoll-Rand Com- Company, of Sherbrooke, P.Q., has secured the sole Canadian manufacturing and selling rights for the Wellman-Seaver-Morgan Company of Cleveland, Ohio, makers of large turbines for hydro-electric development. Machines for the Canadian market will now be made at the Sherbrooke plant.

* * *

On Saturday of last week the "Canadian Navigator" was successfully launched from the yard of the Canadian Vickers Company. This vessel has a deadweight capacity of about 4,350 tons, and is the sixth vessel built by this company for the Canadian Government. The boat will have a length between perpendiculars of 320 feet, a beam of 44 feet, and a moulded depth of 25 feet. When the vessel has been fitted out she will take on a cargo for Liverpool.

* * *

Considerable congestion has taken place during the past few weeks in the harbor of Montreal owing to the inability of transferring the grain from the lake boats to the elevators, the latter being filled to capacity. The British labor situation has prevented regular ocean shipments, so that many vessels coming down the lakes with grain had to lie some time in port before they could get a chance to discharge their cargoes. Better conditions are looked for from now on.

* * *

A large Canadian manufacturer of air compressors states that the demand for this class of equipment at the present time is quite heavy. They state that during two weeks of September they disposed of fourteen machines, and the demand continues active. It is just recently that the inquiries for new compressors have been of any volume, as for the past year or more the trading in second-hand equipment has prevented an active market in new machines.

* * *

Unless something develops to upset the present plans for stable reconstruction work next year we can look for considerable progress in the expansion of Inter-British trade between the Mother Country and the various Dominions. Already several of these have established associations of manufacturers, to further this trade, and all the others are falling into line. One factor of after-the-war trading that is of special interest is the business of approximately $40,000,000 that Canada has done with Greece.

* * *

A statement issued by the British War Office gives the following interesting data regarding the comparative number of bombs dropped by aviators on both sides during a single month. In the area occupied by British troops in France during that period German aviators dropped 1,482 bombs, while British airmen let loose 7,653 bombs into German-occupied areas in the same month.

* * *

It is not generally known that the American Federal Board for Vocational Education maintains a course designed to prepare disabled soldiers for civil service positions. There are 32 men now studying to qualify themselves for positions under the civil service, and the Board will undertake to prepare any student who so desires, provided he can qualify as physically competent to do the work. Of course there are some regulations regarding these positions and men obviously handicapped cannot expect to hold down jobs where their physical disqualifications are such as to prevent the proper discharge of the duties. But on April 16 the President authorized an amendment to the civil service rules which permits the civil service commission to exempt from the physical requirements established for any position, a disabled and honorably discharged soldier or sailor or marine upon the certification of the Federal Board for Vocational Education that he has been specially trained for and has passed a practical test, demonstrating his physical ability to perform the work sought. Under the law a disabled soldier has a preference on the civil service list.

* * *

Mariners who frequent the coast of Peru are familiar with a curious phenomenon that occasionally prevails there —notably in the harbor of Calloa—commonly known as the "painter." The water becomes discolored and emits a nauseous smell, apparently due to sulphuretted hydrogen. The white paint of vessels becomes coated with a chocolate-colored slime; especially when the wet fog, known as the garua, prevails at the time. Presumably both the discoloration and the smell are due to the decomposition of marine organisms. In a paper recently presented to the Geographical Society of Lima, Senor J. A. de Lavalle y Garcia discusses this phenomenon (which he calls "aguaje") and concludes that the primary cause is the seasonal shift of ocean currents. The "painter" prevails during the months December to April, at which time the warm equatorial countercurrent displaces the cool Peruvian current. The resulting change in temperature of the ocean water would, he thinks, kill quantities of plankton, and the decay of this organic matter would give rise to the phenomena observed.

* * *

The inactivity of the Russian platinum mines has caused a corresponding increase in activity in Colombia. A large company has recently been formed to operate in Colombia, which is reported to hold 10,000 acres of land as well as 50 miles of river bottom. The operations of this company should materially increase the output of platinum from Colombia. It is announced that the War Department, through the Chief of Division of Sales of Munitions will dispose of 19,000 ounces of platinum at a minimum cost of $105 an ounce. A substitute for platinum in electrical apparatus has been the object of some private investigations. One satisfactory substitute for cathodes was found to be 90 per cent. gold and 10 per cent. copper.

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New Salvage Method Succeeds

WE have heard of many new schemes for ship salvaging of late. This was inevitable in view of the vast numbers of vessels that have been sunk during the last five years. Some of the schemes have been fanciful, and outside the realms of practical possibility.

Vickers, Ltd., of Barrow-in-Furness, England, have brought out a system which has been successfully employed in raising the wreck of the steamer "Main," in Luce Bay, Scotland. The firm which made the experiment was the Ardrossan Salvage Company, of Glasgow, a well-known firm in this class of business. The means employed are canvas pontoons, collapsible, and capable of being inflated by compressed air. While weighing only one ton, they are capable of exerting a buoyant force of 100 tons when inflated. In the case of the vessel referred to, the pontoons were fixed to the stern post, and inflated by means of an air compressor on a tug. When the vessel cleared the bottom, she was towed into shallow water and pumped out. The pontoons withstood all the severe handling without injury, and there seems to be no reason why they cannot be made in much larger capacities.

The advantages are obvious when compared to the ordinary wrecking pontoon, or camel, as they are usually called. In general, these barges have to be towed to the scene of the wreck, and are very susceptible to serious damage by heavy seas when in position. They are costly to build and expensive to maintain. The new pontoons can be packed on the deck of the tug which also carries the air compressor. Enough pontoons could be stored on one boat to raise the largest ship. Furthermore, by judiciously placing, a submerged hull could be given any desired trim as she floated. Vessels lying on their side could be straightened up onto an even keel by making fast on the low side and inflating. The possibilities of this method seem infinite, and it is cheap in every way. Further experiments on larger ships will be watched with interest.

If Great Britain can use such a cheap and effective method on a large scale, it will go a long way to offset the competition of foreign shipbuilders. Great Britain has enough tonnage lying at the bottom of the sea, cheerfully sacrificed for the common good, to make her biggest competitor sit up and take notice, if it should be reclaimed.

The Problem of the Foreigner

NEWSPAPERS take various views of the struggle going on in the steel industry of the United States. It is all very well for stock brokers to say that the strike is dwindling to an end—to pooh-pooh the whole thing as a half-baked upheaval amongst what they term the "bohunks," and, in short, to tell these "hunkies" if they don't like things here they had better clear out.

The fact is that any movement that can, on short organization effort, pull hundreds of thousands of men from work on a given day, has got to be noticed. It cannot be dismissed with a wave of the hand unless we wish to move across and dwell in a real honest-to-goodness fools' paradise.

Get back to facts. These hunkies were brought to this country by the big concerns that are now fighting them. The steel mills of United States wanted cheap foreign labor, and they scoured Europe for it.

They imported human beings in quantities. They were out to gather up human industrial wheels, not future American citizens.

And so they raked these chaps together—the rag-tag and bob-tail of the continent, and turned them loose on this continent.

They brought with them their racial hatreds and loves, their nightmares of oppression for years gone by, their wild dreams of the day when they would rise up and take possession—for mark you, these hunkies are steeped in the words of Marx and stewed in the teachings of anarchy.

Well, what happens? In this country they find the agitator here. It pays him to agitate better than to work. It is a thousand times easier to earn his bread by the sweat of other men's brows than to have anything approaching moisture decorating his own head.

That influence goes after the foreigner. It is more insistent than anything else. He meets it in the mill.

He comes in contact with it when off the premises.

And what do we do for the foreigner? Well, we herd him, regulate him and fine him, and if this fails, lock him up.

We don't want him living on our street, eating in our pet restaurant, going to our club, sending his children to our school. Not much! We herd these fellows, and then our splendidly-made law seeks to regulate them.

Do we do nothing for them? Surely we do. We send officers to search their homes for booze, to inspect their back yards and occasionally we fatten our police court revenues by fining them!

The foreigner is in United States and in Canada. He was, in many cases, urged and asked to come. He is here to stay, and he can be either a decent citizen or a nuisance and a danger. He is not thinking for himself. It is the law of the mob all over again, and unless some mighty big influence is turned loose he will increasingly shuffle off to the nuisance class.

BUT what is the outlook for the foreigner who thinks? Well, here's a true case:—

He was a cobbler—not in a particularly large way. The staff consisted of himself. He bought the stock, cobbled the shoes and collected the cash.

He had come from Italy ten years before and was making his way by hard work. But this cobbler did more than cobble shoes. As I sat there one night waiting for him to finish an odd job, he wanted to know how the British railway strike had been settled—he asked if Asquith had any chance of getting back the ground that Lloyd George had cut from under him—he talked of the lack of interest in the Ontario elections, and had a solution for the world's unrest, in the simple life. And as he hammered and stitched, he reasoned about the folly of our ways—"My wife buys a coat and wears it on cold days. At the end of the winter she puts it away. Next winter she takes it out, looks at it and sees that the cloth is good, lining good—but the men who make the styles have spoiled that coat. It is out of style. By this system they are able to make people go into the market and buy things they do not need. They are able to make people spend money that should go for other necessary things."

And so he talked and worked. That Italian cobbler was, in his way, doing more real thinking than thousands of native Canadians who never seem to have or take time to let their brains settle down to perform the function for which they were created—some real, solid reasoning and thinking.

THE foreigner is in United States to stay, and he is in Canada to stay. He is not going to take a sudden or a violent notion over-night to pick up and clear out.

Canada need not imagine that the problem of the foreigner belongs exclusively to United States. It does not. It exists here. We have it in Ontario and we have it all the way across to British Columbia.

It was strong enough during the stress of war to tie up Alberta coal mining properties, and it was defiant enough to create conditions that would have forced, if possible, Canada's war effort to drift to the dogs.

It is not possible to road-roller the foreign population in North America into a harmless mass that will do a lot of slugging and dirty work and not ask too many questions. It is not possible to keep out the agitator. Root out one to-day and a new one has sprouted for the morrow.

What then?

The best first step is to shut the gate that lets him in. In other words, hand-pick our immigrants. That will at least prevent the problem from becoming more serious. That may be a negative virtue, but it is a **move.**

Then to Americanize and Canadianize them. Big job? Yes. Tremendous!

Well, why bother with it?

For the very simple yet very forcible reason that we've got to or else house a menace and a danger for years to come.

This work must be done by cities, towns, factories, and every other agency we can turn loose upon the foreigner. Play square and firm with him. Remember, we have got to "get him," or he will be a big power in the force that aims to "get us."

SHEETS are coming in very slowly now owing to the strike. Serious business, too, with cold weather coming on, and all sorts of bedding very scarce.

* * *

CANADA is soon going to have 20,000 miles of Government-owned and operated railroads. This is a much greater mileage than the Government is now muddling with. But—the greater the mileage the greater the muddle.

* * *

A CAMPAIGN to stop smoking makes no headway. It's impossible to control the crop of tobacco, cabbages, mullin leaves, cedar bark, smoking cane and whip handles.

* * *

THERE'S many a four-flusher discussing with his friends the location of the Rolls-Royce plant in America, and at the same time reading the sale ads. for a mussed-up flivver.

* * *

FROM a recent report on the subject we glean the interesting bit of information that "pseudowollastonite is the alpha form of calcium metascilicate." For our own part we'd never known before that any person could stay under water for such a long time.

FROM A CALF'S DIARY	FROM A DITTO DIARY
Kicked over my pail of mash.	Kicked for half an hour about my job.
Got my head caught in a bucket.	Got my head full of thoughts of how undervalued I am.
Yelled like blazes for mother for an hour.	Yelled like blazes at everybody who didn't please me.
Rolled my eyes at a little boy and frightened him.	Rolled a cigarette so as to have it ready for the first opportunity to get a few puffs at it.
Experimented on how far I could spraddle my legs.	Experimented on how far I could go doing nothing and get away with it.
Tangled myself in ten feet of rope.	Tangled myself in mental trash.
Nibbled at a small green apple and had a tummy ache.	Nibbled at a small green apple and added a disordered stomach to my other disqualifications.
Refused to be hugged by an impudent hired man.	Refused to be mindful of all the comfortable conditions under which a man works in these times.
Hoard's Dairyman.	

From *Threads*



Educational Items for Future Officers

A Series of Questions and Answers on Subjects Pertaining to Seamanship—Rule of the Road—The Use of the Chart—These Articles Will Appear Monthly

Continued from last month's issue.

Rule of the Road

THOSE that have followed the series of articles on the "Rule of the Road" would gather additional information that will stand them in good stead if they should purchase a copy of the "Rule of the Road" as issued by the Department at Ottawa, so they could follow the series of articles with more attention, perhaps. Copies of the "Rule of the Road" can be obtained from the Department or from the Secretary of the Canadian Merchant Service Guild, whose address is at Collingwood, Ont.

MAGNETS AND THEIR ACTIONS

(Continued from last issue).

Que.—How many different kinds of MAGNETS are there?

Ans.—MAGNETS are of TWO KINDS, NATURAL and ARTIFICIAL.

Que.—What is a NATURAL MAGNET?

Ans.—It is composed of an OXIDE of IRON, having a CHEMICAL composition, found in many parts of the world, but first discovered in MAGNESIA, ASIA MINOR, from which it derives its NAME.

Que.—What is an ARTIFICIAL MAGNET?

Ans.—A piece of STEEL or hard iron rendered MAGNETIC by ARTIFICIAL MEANS, and by this process so EXCITED that at the opposite ENDS, TWO opposite FORCES are produced.

Que.—How would you MAGNETIZE a piece of hard iron or steel artificially?

Ans.—Take a powerful MAGNET, and DRAW it SEVERAL times along the BAR to be MAGNETIZED, the BAR will then become a MAGNET, and the LAST end touched will be of opposite POLARITY to the POLE of the MAGNET used, or the Bar to the MAGNETIZED may be placed in a spiral coil of INSULATED WIRE, through which a CURRENT OF ELECTRICITY is circulated; very powerful MAGNETS can be obtained in this manner.

Ques.—How are MAGNETS MARKED?

Ans.—Generally one end is Painted Red, the other Blue.

Que.—Which end points NORTH, and which SOUTH?

Ans.—The Red end points to the North Magnetic Pole of the earth, the Blue one to the South.

Que.—What is the first law of Magnetism?

Ans.—POLES of the SAME NAME REPEL each other, POLES of different names ATTRACT each other.

Que.—Then which would be the NORTH POLE of the MAGNET?

Ans.—If POLES of the same name repel, and the BLUE END POINTS SOUTH, it must be the NORTH POLE of the MAGNET, and contain MAGNETISM of the same name as the NORTH POLE of the EARTH.

Que.—Which end of the Magnet should be put under the north point of the compass card?

Ans.—As the red end of the magnet points to the north magnet pole of the earth, it should be placed under the NORTH POINT of the COMPASS CARD.

Que.—Then if you had a Magnet with no marks upon it, how would you be able to tell the NORTH END from the SOUTH end.

Ans.—Be holding the end of the MAGNET to the NORTH POINT of the COMPASS CARD, if the NORTH POINT of the card is repelled away, it must be the NORTH or RED END of the MAGNET, if the NORTH END of the Compass Card is attracted, it will be the SOUTH or BLUE END.

Que.—How would you find the deviation of the COMPASS by a BEARING of the NORTH STAR?

Ans.—Take a bearing of the star by the compass, and what it bears, away from North, will be the error approximately easterly or westerly as the compass is drawn to the right or left; apply the variation and the sum or difference, as the case may be, is the deviation.

Que.—How would you find the deviation by reciprocal bearings?

Ans.—First take a vessel far enough away from a light or point so, that, in turning her around you would not alter the bearing, then take the bearings of the light or point, at equal distances apart around the compass, say on Cardinal and Inter-Cardinal points, more preferable on every other point. You will now readily see that if there is no DEVIATION the light or point would bear the same on all headings, any difference would only be deviation on one-half of the compass as there is WESTERLY on the other, the MEAN of the whole must

be the CORRECT MAGNETIC BEARING of the light or point from you, which would be found by adding all the bearings taken; the deviation would be the DIFFERENCE between the correct magnetic bearing, and each of the bearings taken easterly or westerly as the correct magnetic bearing is to the RIGHT or LEFT.

Note.—If you should have bearings on each side of a Cardinal point, you will have to bring them all to the same name before adding them together.

VARIATION

Que.—What is VARIATION?

Ans.—The distance the magnetic needle is drawn from the true north through the influence of the earth.

Que.—Would variation be the same all over the chart?

Ans.—No; it would be different in different LOCALITIES.

Que.—Would variation remain the same in all points of the compass?

Ans.—Yes; as long as the ship remained in the same place.

Que.—Would variation remain the same at all times in the same place?

Ans.—No; it has an ANNUAL CHANGE.

Que.—Where do you find variation?

Ans.—On the chart.

Que.—What part of the chart?

Ans.—It may be on the Compass Rose, or variation lines drawn over the chart, or from variation chart issued for the purpose, or on a variation scale on the side of the chart.

Que.—Is there any place where there is no variation?

Ans.—Yes; on the line of no variation.

Que.—What do you know about the line of the variation?

Ans.—A place where the westerly and easterly variation is the same strength, attracting or repelling both ends of the needle the same amount, causing it to point to the true north.

Que.—How do you correct variation?

Ans.—Variation cannot be corrected, but we can allow for it, as the AMOUNT is given on the CHART for whatever LOCALITY we may be in.

STARBOARD SIDE—We mean by this expression, that side of your vessel on the right hand while standing on board looking towards the bow. Then, generally speaking, we mean in speaking of STARBOARD (without the side), we take it to mean pertaining to, situated or turned towards the right of the observer on a vessel when we are looking towards the bow.

TO STARBOARD THE HELM, remember I said HELM, to put or turn the tiller (helm) to the STARBOARD or right (side) in looking forward, as in changing the course.

PORT—Meaning that side of your vessel on the left hand while standing on board and looking towards the bow. To turn or send to the PORT side, as to PORT the helm; that is to turn or put the helm or tiller to the PORT or LEFT side of the vessel looking forward.

STARBOARD—Meaning to turn, shift or go towards the STARBOARD or right side.

PORT—To turn, shift or go towards the PORT or left side.

To sum it up in brief, STARBOARD the right side and PORT the left side.

Then in speaking or talking of A BEAM, meaning at right angles to your vessel's keel, as we often hear it said, the light bears or bore a BEAM which, of course, means at right angles to the keel or ship's head. The wind is a BEAM or on the BEAM or at right angles (90°) with the keel or direction of your ship's head.

ABAFT, which we mean towards the STERN of your ship, or in other words BACK behind or on the after side of. ABAFT the Foremast, meaning just back or behind the foremast. We speak of abaft the wheelhouse, abaft the cabin, abaft the funnel, etc., all of which mean, of course, on the after side of those objects I have mentioned.

ABAFT the BEAM when the wind or object bears on some point which is more than a right angle (8 points or 90°) from the ship's course within any part of that arc of the horizon contained between a line at right angles with the keel of the vessel and that point of your compass directly reversed of the vessel's course. Then we have ASTERN, meaning, of course, behind the ship or vessel; AHEAD, meaning in front of or before the vessel.

AMIDSHIPS—This word means in the middle of the ship or half way between stem and stern. We use the expression HELM AMIDSHIPS meaning to keep the rudder in line with the KEEL, or in a small boat the tiller would coincide with the AMIDSHIP fore and aft line of the vessel. The steering wheel is AMIDSHIPS, or put your wheel AMIDSHIPS, meaning that the helm or tiller is in the same line with the keel or that the tiller is not put over either to one side or to the other. The AMIDSHIP line runs exactly at right angles with the AMIDSHIP fore and aft line. It must not be taken as a hard, fast rule that AMIDSHIP necessarily means half way between stem and stern, but the literal meaning is often taken as AMIDSHIP, being the widest part of the ship. A true Athwart ship line passing through the widest or beamiest part of a ship is in reality the AMIDSHIP line.

FORE and AFT, meaning from stem to stern the lengthwise of the vessel. The AMIDSHIP fore and aft line meaning a line passing through the centre of the vessel from stem to stern in a true fore and aft direction. This line meets and passes through the centre of the AMIDSHIP line.

ATHWARTSHIPS, meaning across the ship from one side to the other, the opposite, of course, to fore and aft. Then we talk of BEFORE the BEAM, meaning in an arc of the horizon included between a line that crosses the ship at right angles and that point of the compass towards which this ship steers.

FORE and AFT line does not necessarily have to pass through the centre of the vessel from stem to stern. This would be the AMIDSHIP fore and aft line. A Fore and Aft line is really parallel to the AMIDSHIP fore and aft line. An ATHWART line is not necessarily the AMIDSHIP line, but is parallel thereto. The ATHWARTSHIP line is at right angles to fore and aft line and the two together are parallel to the AMIDSHIP fore and aft line and the AMIDSHIP line. To condense it, in the AMIDSHIP and fore and aft line means any point on the Amidship fore and aft line. We will say a ship's compass if possible is located on the AMIDSHIP fore and aft line of the ship. If it cannot be placed on this line you can place it parallel thereto, anyway you can find a true fore and aft line. In speaking of the helm or tiller, I mean the bar by which the rudder is turned starboard —starboard your helm—are commands meaning that the helm itself or by means of the steering wheels or other apparatus be put to starboard or towards the right side of the ship. When the helm or tiller is put to starboard, remember, the rudder swings the opposite way, or to port, that is the blade of the rudder ketches the water or drags to port and directs the course of the vessel the same way—the helm is put to the right (starboard) and the vessel goes toward the left (port). When the order is given to wheelsman to STARBOARD, it is meant that the wheel should be turned so as to cause the helm or tiller to put to STARBOARD and the ship's head directed to PORT, or towards the left. I am sure that this would bother a great many yachtsmen and perhaps some of us have not given it the thought and study it deserves. There are many people who travel on a vessel that do not understand why the vessel's head should go towards the left or port when the order is given to STARBOARD, and vice versa when the order is given to PORT and the vessel goes to STARBOARD. I have been with wheelsmen who have not understood why this is. Many merely know that when the order is given to STARBOARD the vessel is to have her course directed to PORT, and the order to PORT the vessel's head is to be directed to

STARBOARD or toward the right. I would say right now that in speaking to both those who manage and guide the larger craft as well as those who guide the smaller craft that it is well to remember and pay attention to whether the steering apparatus is what is termed straight or cross-geared chain, that is whether the chains or cables leading to the tiller from the steering gear cross each other, or whether it leads straight. If straight-geared the boat follows the steering wheel, that is, if the steering is revolved or rolled to PORT or to the left the boat's head likewise goes to PORT, because the helm is drawn or pulled over to STARBOARD, also if the steering wheel is rolled to STARBOARD the vessel's head likewise goes to STARBOARD, because the helm goes to port. Remember, I said the helm or tiller is the bar by which the rudder is turned. With the cross chain, remember what I have just said, the conditions are reversed. When the steering wheel is rolled to STARBOARD the helm also goes to STARBOARD and the vessel's head swings to PORT, and when the wheel is turned to PORT, the helm likewise goes to PORT and the vessel's head swings to STARBOARD. Remember, no matter whether the gear is straight or crossed when the order is given to STARBOARD it means that your helm is to be put to STARBOARD and the vessel's head directed to PORT and vice versa. Thus, it will be seen that the command STARBOARD and PORT, means only the direction in which the helm is to be moved, regardless of the motion of the steering wheel in order to accomplish this; sometimes the order is given to STARBOARD your wheel which means just what I say—that is, roll the steering wheel to starboard no matter whether it be a straight or crossed gear. If it is a straight gear you would desire the ship's head to be directed to STARBOARD; if crossed gear, you want the ship's head to go to port. Of course you would understand that if the order was given to PORT your wheel the conditions I have just read would be reversed. Remember, that STARBOARD means the direction in which the helm is to be swung and that PORT means to turn the helm to PORT or towards the left, the boat or vessel in either goes the opposite way to which the helm is swung or turned. I will say again that I would not have you get confused in this matter, and in speaking of the helm it is as I said before, the bar by which the rudder is turned. Then we speak of STEADY, an order to the man at the wheel, meaning to have the direction of the ship's head unchanged and kept on her course; then we hear (Keep her steady), meaning to keep the vessel on the one course; then again we have (Steady as you go, steady as she looks, or just as she looks), meaning I take it to keep the vessel on whatever course the compass shows at the instant the command is given; then again Steady at STARBOARD, which means that the tiller or wheel should to swung to starboard gradually; then again Steady APORT, meaning that the tiller should be moved to PORT slowly; then another expression we have, Let her come, or let her come faster, meaning to give the ship more helm, more rudder, turn your wheel faster; then we have an order "slow," meaning to begin slowly to put your wheel AMIDSHIPS so as to steady the vessel on a direction, then you will have the order, Do not give her so much wheel—a spoke at a time—meaning that you are revolving the wheel too fast or too far, causing your vessel to sheer too much, which you wish to avoid. I need not give an explanation for the expression, Give her more wheel—let her come—for that explains itself. Then we have Hard at Starboard, means to pull your helm over to starboard as far as it will go; Hard at Port, similar of course. These are a few preliminary remarks that will give rise to discussion no doubt, and as I will repeat, the objects of these lectures are to stir up the discussion, get you further interested, I do not need to say perhaps further talking, but surely it will make some think. Now we will come on to the regulation lights: SIDELIGHTS—RED and GREEN. Now all (some exceptions) vessels, whether steam or sail, are obliged to carry a green light on the STARBOARD side and a red light on the PORT side. And each light shall be constructed so as to throw an unbroken light over and aft of the horizon of 10 points, which equals one hundred and twelve and one-half degrees of the compass, so fixed as to throw the light from straight ahead to two points abaft the beam on either side, that is, the green light shows from straight ahead to two points abaft her starboard beam and the red light from straight ahead to two points abaft the beam on the port side.

(Continued in next issue)

EDITOR'S NOTE

The following diagrams were unfortunately omitted from Captain Laing's article on Seamanship and Navigation last month. For the benefit of those readers who were studying these articles, these are now published.

Diagrams

In the North Atlantic the sun appears to act in the heavens as you see it in the drawing, the earth revolving on its axis, causing the orb to sweep the firmament with a semi-circular motion.

The first sun on the left is rising out of the sea and gives the bridge officer an opportunity to work up an amplitude for compass correction—deviation

The second sun on the left is in a good position for a.m. chronometer sights for longitude.

The third sun on the left is good for the shadow pin or azimuth mirror or pelorus—compass correction.

The sixth sun is ready for the problem known as "reduction to meridian." This is only used where the sun is likely to be obstructed by clouds at exact noon.

The central sun marked noon is the highest sextant altitude for the day and is called the "meridian altitude."

(Continued on page 48)

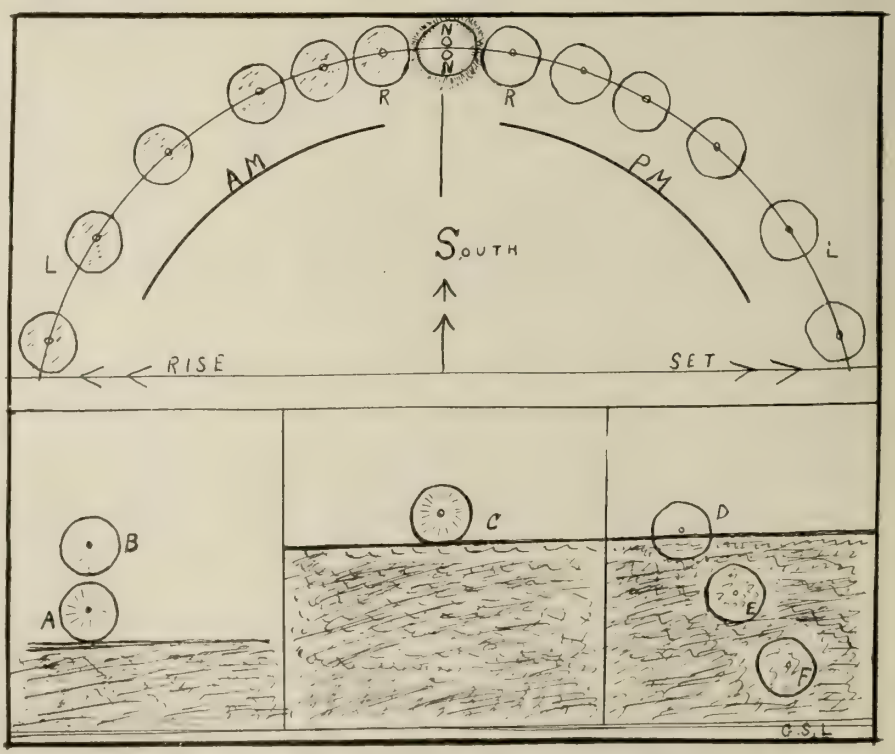
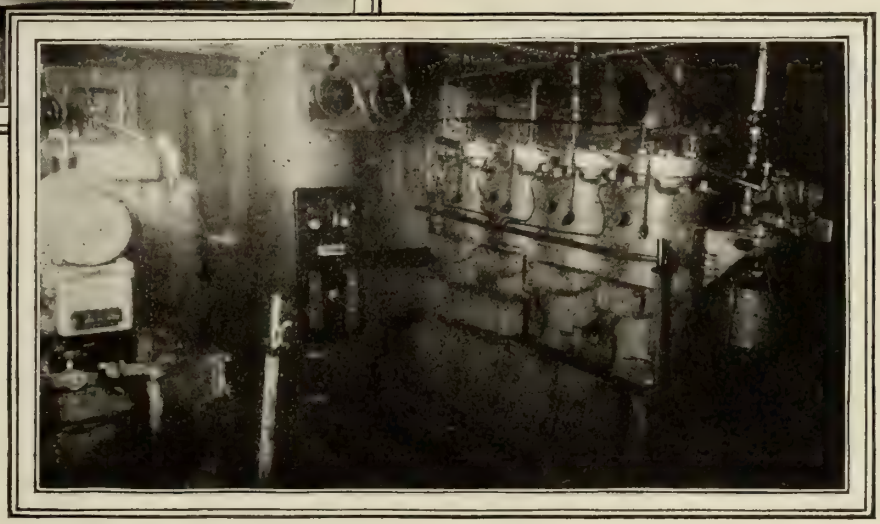


DIAGRAM OF SUNS ASCENSION



Auxiliary Motor Schooner "Samuel Courtney," 1918, equipped with 2-100 H.P. Fairbanks-Morse type "C.O." Semi-Diesel Crude Oil Engines.

Twin Screw, 7 Knots, 531 Gross Tons, 441 Net Tons, 171′ long, 35′ beam. Geo. M. Barr, Owner; Sam'l M. Courtney, Master; O'Brien Noel, N.S., builder.



Twenty-three Days—Newfoundland to Greece

This is the record of the auxiliary Schooner "Samuel Courtney" and Mr. S. Courtney, her master, attributes it to her

Fairbanks-Morse "C.O." Engines

Fairbanks-Morse C.O. Engines have proved their economy, made possible by their using low priced fuels, and now the long distance speed record has been established. Each C.O. —30 to 200 H.P.—gives perfect regulation under all loads.

The Canadian Fairbanks-Morse Co.
Limited

Halifax, St. John Quebec Montreal Ottawa Toronto Hamilton Windsor
Winnipeg Saskatoon Calgary Vancouver Victoria

MARINE NEWS FROM EVERY SOURCE

Buffalo.—The longshoremen's strike in New York is making itself felt at Lake ports, embargoes being placed on flour and other merchandise for export at the head of the lakes. Ore shipments down the lake to Buffalo have fallen off considerably, and little grain is being shipped.

Midland.—The Midland Shipbuilding Company have launched their third steamer for the Imperial Munition Board from their yard at Midland. The vessel launched recently was called the "War Fury," and was a full canal sized vessel of 3,400 tons, 261 feet by 46 feet 6 inches and 23 feet depth.

Detroit.—There is considerable congestion at Detroit owing to lack of unloading facilities at other ports due to strikes and threats of strikes. Approximately 4,065,000 tons of ore were detained in the river 24 hours or more, and this week 15 big ore carriers have been held up.

The "Canadian Seigneur," of the Canadian Government Merchant Marine, sailed last Friday on her maiden trip from Montreal to Liverpool, with a full cargo of grain, pulp, newsprint, sugar, meats and lumber. The "Canadian Seigneur" was launched at Vickers on May 17 last.

Halifax.—A message from the coast of Labrador speaks of the loss of the new tern schooner, "Team 16." The vessel was recently sold by A. Moulton & Company to Hon. P. Templeman, Newfoundland. She was launched from the yard at Conquerall Bank on August 27. The crew of six were all saved, and the value is fully covered by insurance.

New Glasgow. — The "Canadian Sealer" was launched from the yards of the Nova Scotia Steel & Coal Company recently. The vessel is of the 2,800 ton class, and has an overall length of 238 feet, and 35 feet beam. A sister vessel is on the ways, and another keel was laid immediately after the "Canadian Sealer" had vacated the berth.

Sydney, N.S.—The concrete schooner being built at North Sydney by Ivan Buyley and W. N. McDonald, has now progressed to the stage where the moulds are all complete and ready for pouring. Mr. Jones, Llovd's inspector of steamships from New Glasgow, has arrived at North Sydney for the purpose of inspecting the work done so far on the vessel.

Work May Start Again.—Work on the Welland Canal, which has been stopped for several weeks, owing to labor disputes, may be resumed in the near future. The Minister of Labor is in favor of the work being resumed this winter on account of the probable amount of unemployment, and Dr. Reid, the Minister of Railways and Canals, is going to bring the matter before the Cabinet. The decision of the Cabinet will be accepted as final.

Belleville. — The schooner "Bertha Calkins" of Picton, commanded by Captain Van Dusen and bound for Belleville from Oswego with coal, foundered near Player's Cove in a heavy gale on Sunday night. The vessel opened a seam through straining in the heavy sea. The captain brought his vessel as close as possible to the shore before she sank, and the crew all reached the land in the ship's boat. She sank in 25 feet of water, and there is not thought to be much difficulty in raising her.

New Canadian Steamship Service.—The Marine Navigation of Canada is about to establish a direct service between Canada and Brazilian ports. They are having five steamers built in Holland for the service, and these vessels will be under the Canadian flag when completed. In order to foster Canadian trade with South America a subsidiary company is being formed under the name of the Canada Import and Export Company, with offices in the Coristine Building, Montreal. The first sailing from Montreal is expected to take place before navigation closes, and sailings will be made from St. John, N.B., during the winter. The company have a service between Montreal and St. Nazaire, France, which has been in existence for some years, with two steamers.

Montreal.—The visit of David Rogers, the general works manager of the Skinner-Eddy Shipbuilding Corporation, Seattle, has given rise to some interesting rumors relative to the forming of a great shipbuilding syndicate. According to these tales, several prominent shipbuilders in the States and Canada would amalgamate and lay down yards in the most suitable locations, notably Montreal. Work to the amount of $400,000,000 is said to be already pledged. Old Country builders would be included in the merger.

Belleville.—Bound from Belleville to Oswego, the schooner Grace M. Filer was dismantled in a squall in the Bay of Quinte recently. The mizzenmast went by the board, the main topmast carried away, and several of the head sails. The skipper was standing near the rail, about three feet from where the mizzenmast struck in its fall, and had a narrow escape of being killed. The vessel will be laid up after being repaired.

Brockville.—The steamer Richard W, bound for Ogdensburg, went ashore in Lake St. Louis. Tugs from Montreal endeavored to refloat her without success, and the Donnelly Wrecking Fleet from Kingston was appealed to. The vessel will be taken to Ogdensburg for dry docking after being refloated.

Brockville.—The steamer Keynor, belonging to the Montreal Light, Heat & Power Company, went ashore at Annasette Light, Lake St. Francis, while on a voyage to Montreal. She is expected to float shortly. The steamer Adrian Iselin, which had an accident in the Cornwall Canal a few days ago, has been hauled out at the Ogdensburg Shipyard for repairs.

Sacketts Harbor.—The Donnelly Salvage Company, which is engaged in salvaging the cargo of the barge Hilda, wrecked on Stony Point, is making good progress. So far about 5,000 bushels have been removed from the wreck. The Hilda is exposed to the full sweep of the lake with a south-west wind. and this makes salvage operations difficult. She is lying head on to the shore, and is in about 9½ feet forward and 10 feet inches aft. Capt. Donnelly has no doubt that he can get her off after lightening.

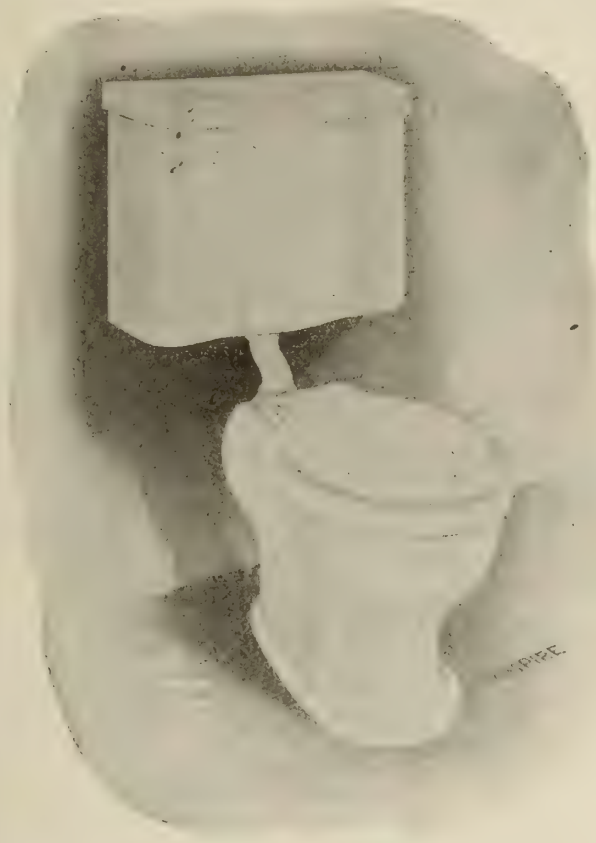
That steps are being taken to relieve the shortage of ocean tonnage is shown in the recent announcement of A. G. Henderson, one of the Glasgow directors of the Cunard and Anchor lines, when he stated that quite a number of vessels were now under construction for the Atlantic trade of his company. In addition to providing increased tonnage for old trade routes, the companies are preparing for other new routes as post-war requirements demand. Mr. Henderson intimated that some of these new boats would probably be ready for the Montreal route for the opening of the season of 1920.

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It is a name that stands for a guarantee of silence.

The Empire Manufacturing Company has never fallen down on a guarantee, we never will.

The "Silentic" is as near silent as any sanitary fixture can be. Every sanitary engineer who has installed "Silentics" is ready to back us in our guarantee.



Silentic-Plate A22-D.

Empire Vitreous China Double Wavered Lowdown Tank, white pyralin coated.

"Action D," and 2" white pyralin coated offset connection.

The scores of householders who have enjoyed the freedom from embarrassment, that the "Silentic" makes possible, are our best advertisement.

But silence is not the only selling point of the "Silentic." Note its handsome snow-white appearance—no nickel to tarnish and spoil its appearance. Like all our lines of plumbing, the "Silentic" meets every requirement. All our sanitary fixtures must be absolutely efficient, non-corrosive, durable, Sanitary or they do not leave our factory.

Empire Manufacturing Co., Limited

London and Toronto, Canada

EDITOR'S NOTE

Continued from page 352

In the curve to the right the positions are the same, only the orb is sinking instead of rising. L shows the p.m. chronometer sights and the last sun is the setting amplitude bearing. Note the sun at noon bears true south.

Now take the lower half of drawing. Take your sextant and look on the horizon at South, the ship's time 11.45 a.m. The sun will appear, as you arrange your instrument properly, to kiss the horizon as at A. In a minute or two look again and Old Sol has climbed to B. Take a turn on your tangent screw and get her down again where she appears at A. This performance goes on till about 11.59 a.m. when the sun gets sluggish and eventually you cannot note any more rising. She just hangs stationary as at C. This is local noon and 8 bells are struck. C represents noon.

Turn to D. and this is how the sun will appear in your sextant mirrors at 12-1 or 12-2 p.m., and very soon she will be sinking in the sea part of your reflectors till she gets at F, and so on.

The A and B suns are rising and have to be constantly screwed down, hence your readings on the sextant arc becomes larger and larger till the stationary period at C.

The p.m. suns are falling and until sunset all sextant readings will decrease.

Have an old silk handkerchief and a bit of chamois in your sextant box and never allow the arc, vernier or mirrors, to get dirty. The colored shades are not so important.

The line marked south at noon is the observer's meridian, an imaginary line running through the ship to the poles and cutting the equator at right angles.

Always remember that the sextant gives you the angular height of the celestial bodies and and such readings from the arc and vernier depend, of course, on the ship's latitude and the sun's declination. Thus the sun can make its apparent sweep in the heavens at any noon altitude, although it need not be overhead as you see it in the drawing.

Question.—As this diagram is for the northern hemisphere and the angular height of the sun appears to be 90 deg. (overhead at noon) what would the approximate latitude be on your ship if the date was June 21?

Answer.—On June 21 Old Sol is nearing his most northerly fence, the tropic of Cancer, which is 28 deg. 28′ north latitude. Then it must be obvious that if you got a sextant reading of 90 deg. on that date your latitude figures would be very close to the sun's declination, 23 deg. 28′ N. Is that clear? It shows plainly the constant relationship between the ship, the sun and the earth. The 3rd mate of to-day is the captain of to-morrow.

Less Space Requisitioned.—The British Shipping Controller has announced that in the future the space controlled by him on steamers to Canada will be reduced. It is at present 50 per cent., but it will be eased off monthly until all space is free for private shipments.

* * *

Following a shut-down of nearly a month, the Sydney plant of the Dominion Iron and Steel Co. has commenced operations on single shift, and it is anticipated that regular work will be resumed in the very near future. For some time prior to the closing down of these works the orders had been falling off, and economic operations of the plant was deemed impossible.

* * *

A very effective agent for moisture-proofing wood has been found in an aluminum leaf coating. This coating practically insulates the wood against any change in atmospheric conditions, and is particularly valuable for use where accurate form and balance must be maintained, as would be necessary in an airplane propeller.

* * *

According to an article in the London "Times" of recent date, the manufacture of laboratory glass started at Sheffield since the war has made substantial progress, though much remains to be done if the industry is to be commercially sound and able to compete in the world's markets. Prior to the war there was no manufacture of laboratory glass in Great Britain, and the whole process, hitherto confined to Germany, had to be discovered and workers specially trained. With this object, a department of glass technology was opened at Sheffield University with the support of the Government, and to-day the department is turning out work said to equal anything Germany ever produced. The experimental nature of the work has made the cost of production heavier than the German article, and to help this a glass research association is being formed. The British Government has been asked to provide $364,987 over a period of five years, and the manufacturers will contribute a further sum of $121,662. It is said that the first attention of the association will be directed to problems of machinery and labor-saving devices.

Sale of 16 Navy Torpedo Boat Destroyers



There will be sold by sealed proposals receivable at the Bureau of Supplies and Accounts, Navy Department, Washington, D.C., until 12 o'clock, 17 November, 1919, the following named destroyers:—

BAINBRIDGE	TRUXTON
BARRY	WHIPPLE
DALE	WORDEN
HULL	FLUSSER
PAUL JONES	LAMSON
PERRY	PRESTON
PREBLE	REID
STEWART	DECATUR

now located in the Fourth Naval District, Philadelphia, Pa.

Exact location may be ascertained from the Commandant, Fourth Naval District, Navy Yard, Philadelphia, Pa., and should be obtained before making trips for inspection. Sales will be for cash to the highest bidders. Right to reject all bids reserved. Forms of proposal, information concerning the vessels, and the terms of sale obtainable from Bureau of Supplies and Accounts, or Commandant of the Fourth Naval District, Navy Yard, Philadelphia, Pa.

JOSEPHUS DANIELS
Secretary of the Navy.

6-10-19

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Free Turning

Round Brass Rod

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62,500 lbs...	.625″	⅝″
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45,000 lbs...	1.250″	1¼″
26,000 lbs...	1.375″	1⅜″
39,000 lbs...	2.000″	2″

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Parish Malleable Iron Shell Tackles have edges *reinforced* at eight different places, and four wide and *heavy ribs* run transversely across the inner face of each cheek.

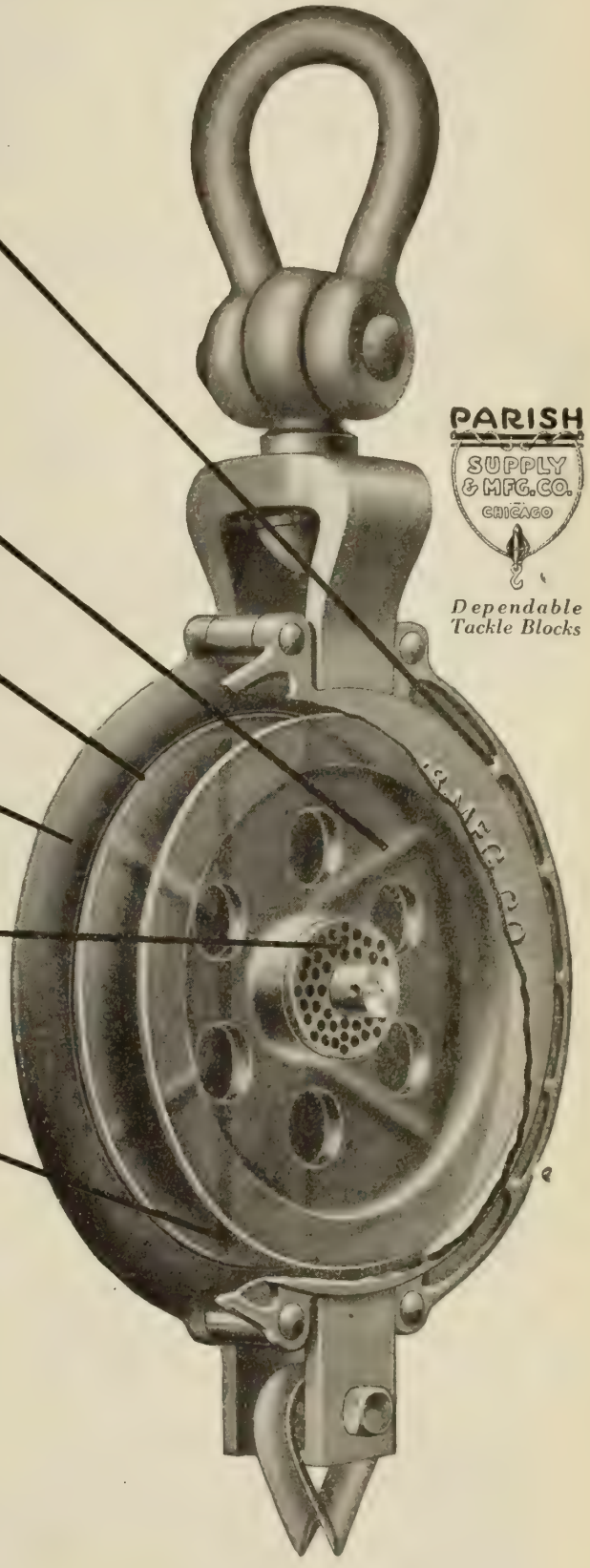
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Supplied with self-lubricating phosphor bronze bushings and *side bearings.*

The straps are forged from specially selected steel and are drawn out to extend the *full length* of the block on both sides.

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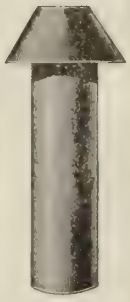
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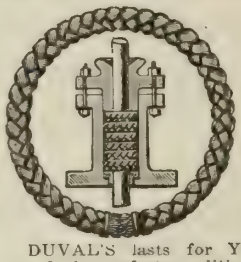
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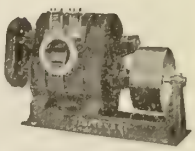
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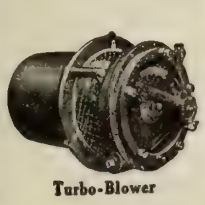

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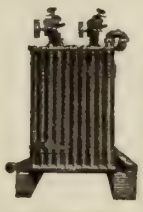

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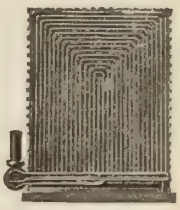

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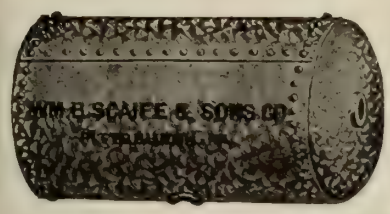
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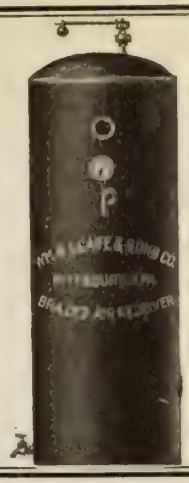


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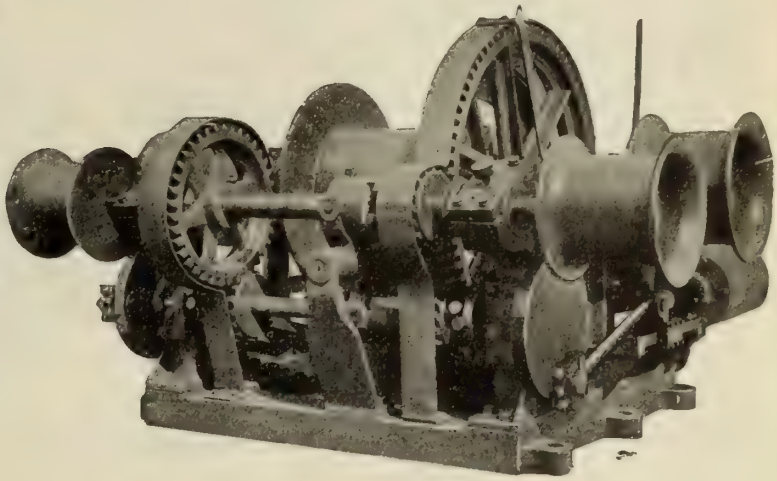
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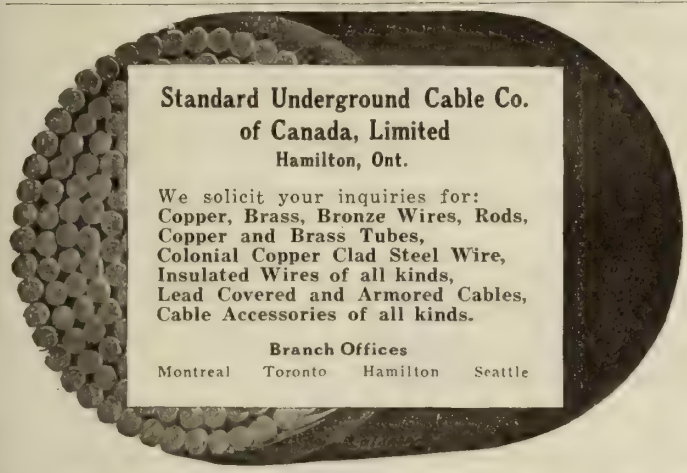
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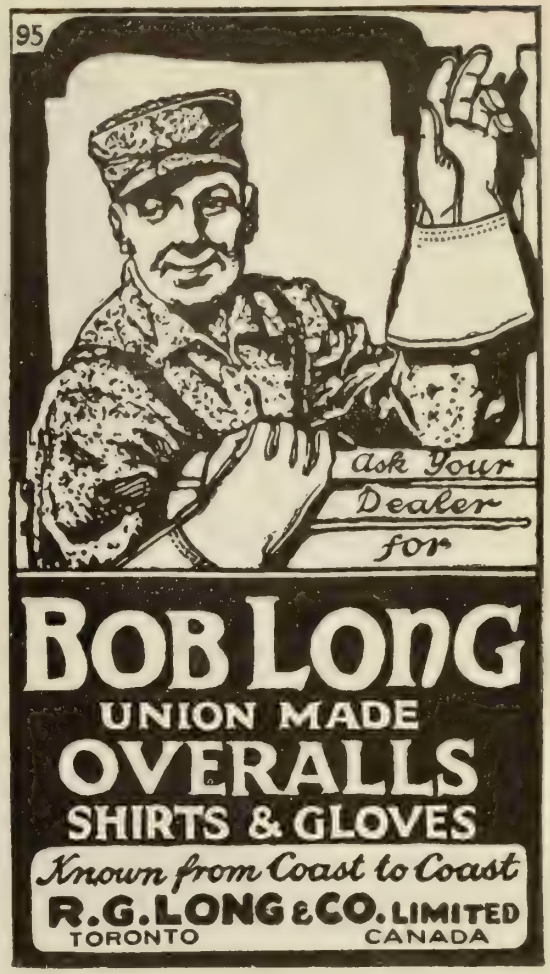
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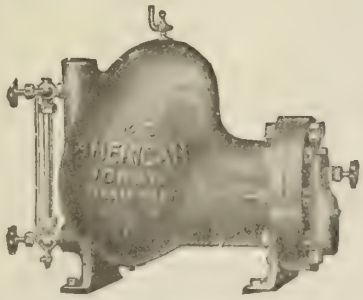
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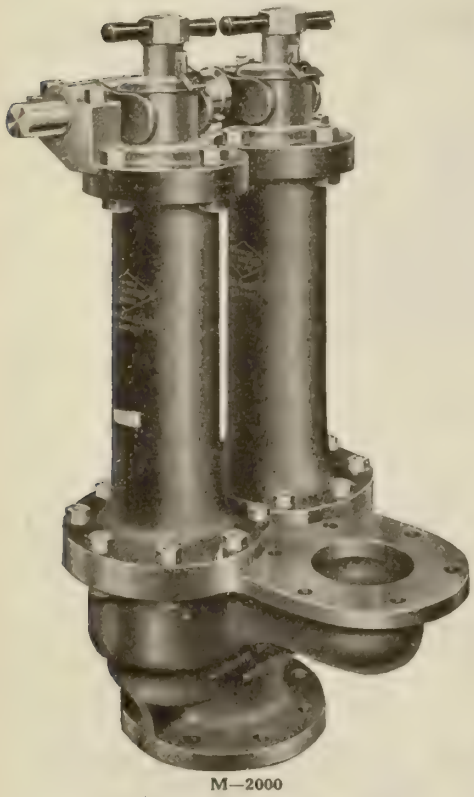
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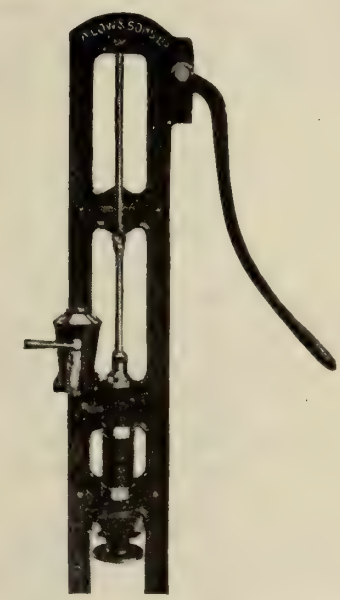
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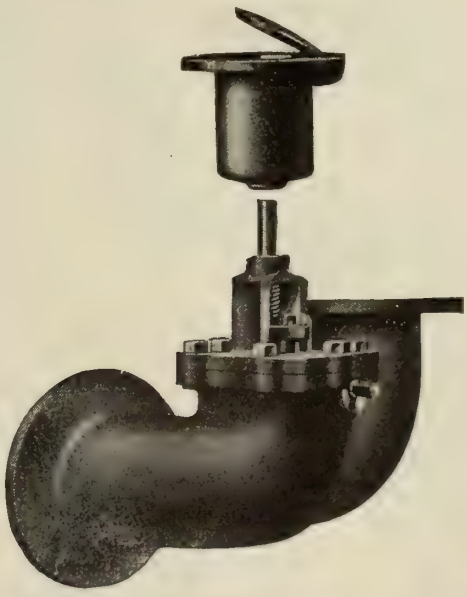
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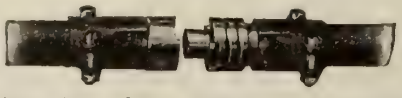


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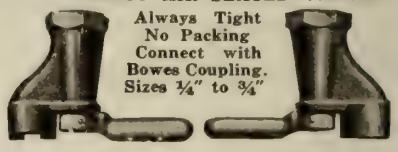
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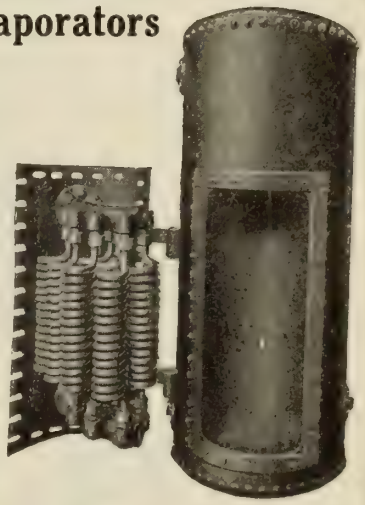
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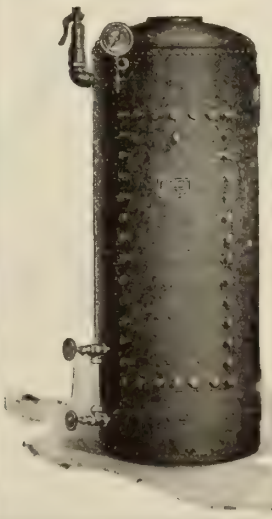
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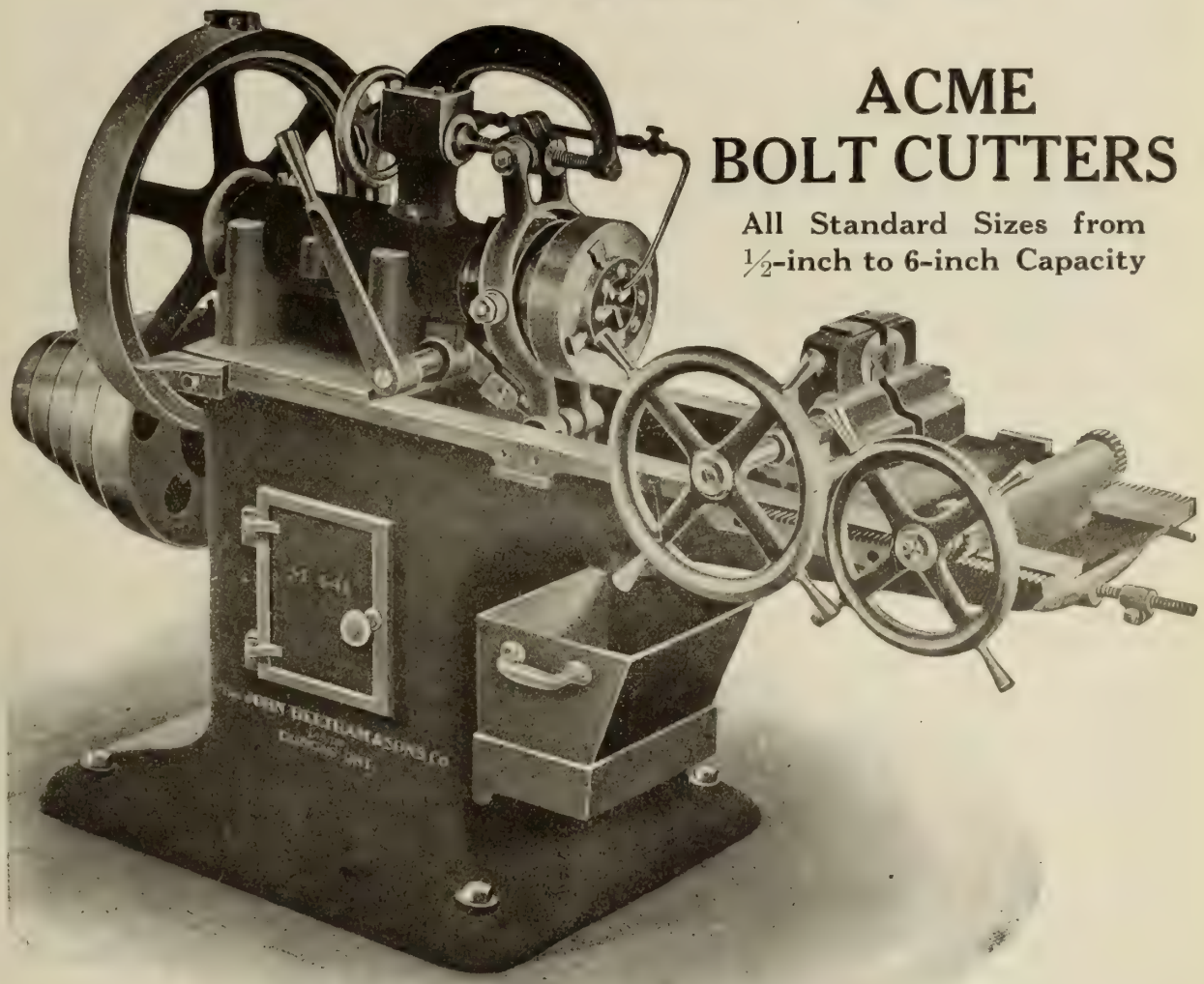
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Average Fuel Consumption per hour, actual running time, 13¾ gallons or 0:43 lbs. per brake horse-power. Total cost of the fuel oil, based on Canadian prices, would have been $1,111.59. With a coal burning steamer, using coal at $6 per ton, the cost would have been $3,000.00 —a saving of $1,900,00 for the Bolinder-Engined vessel.



The concrete motorship "Askelad," 170 ft. x 31 ft., 1,050 tons D.W., equipped with twin 160 B.H.P. Bolinder engines; speed, 9 miles per hour.

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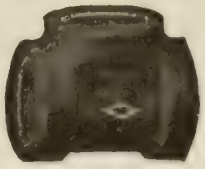
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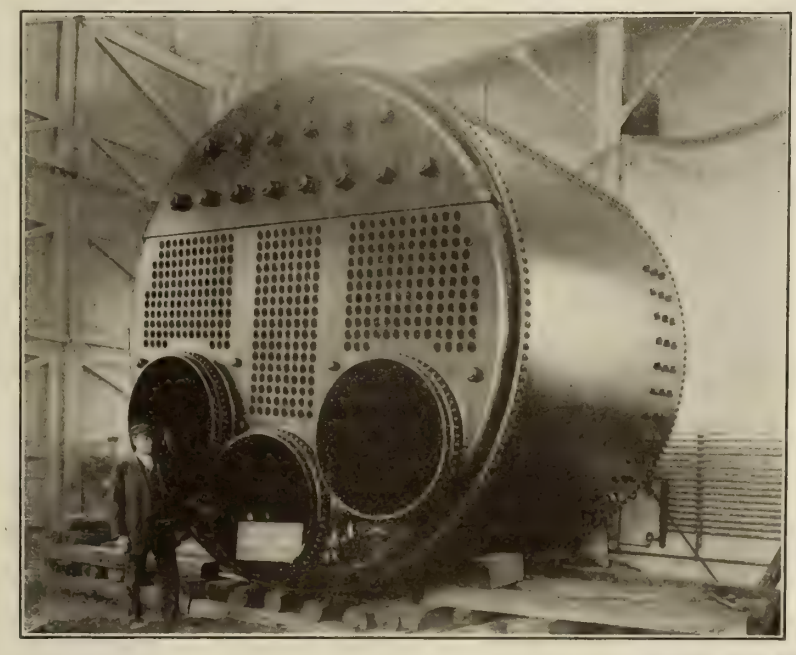
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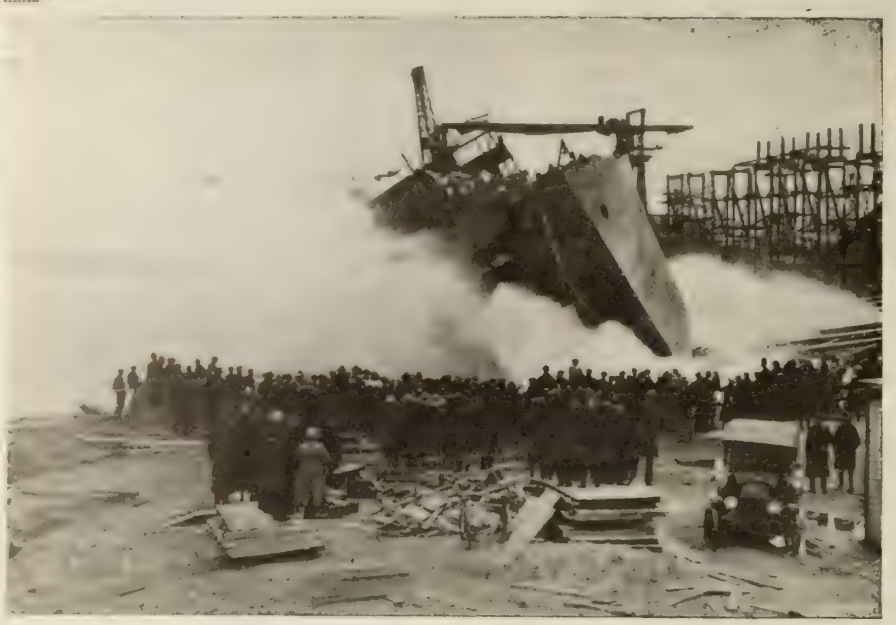
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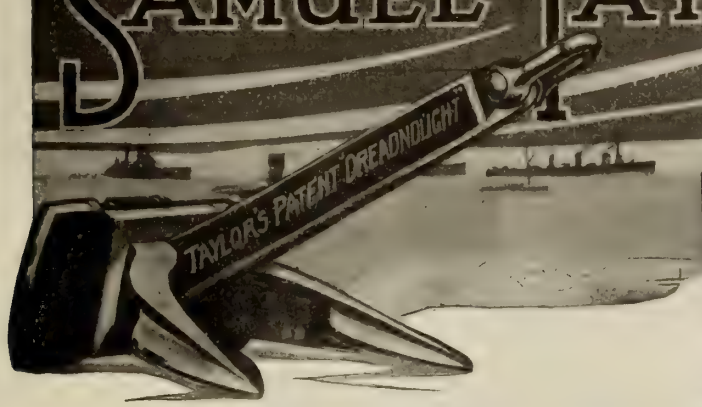
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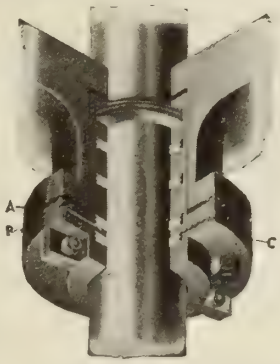
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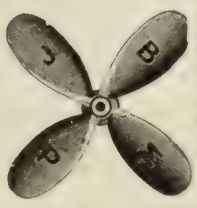
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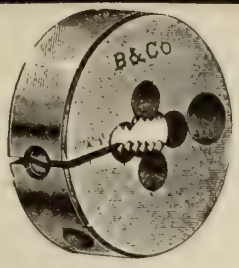
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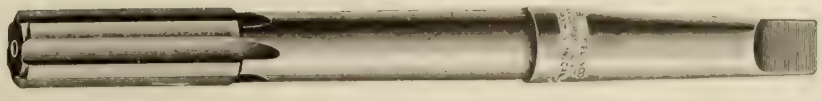
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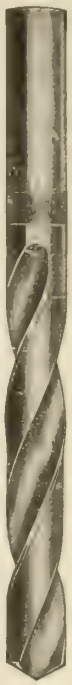
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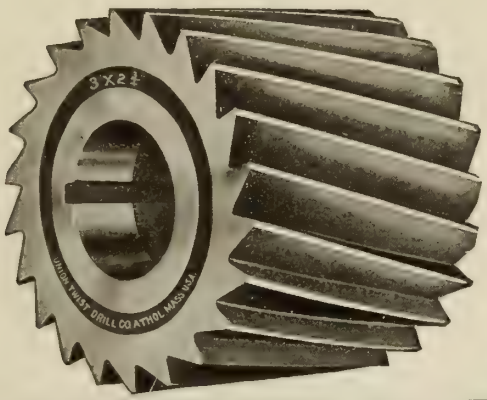
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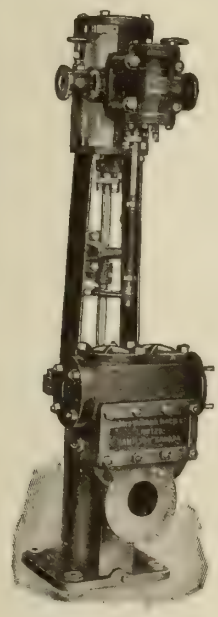
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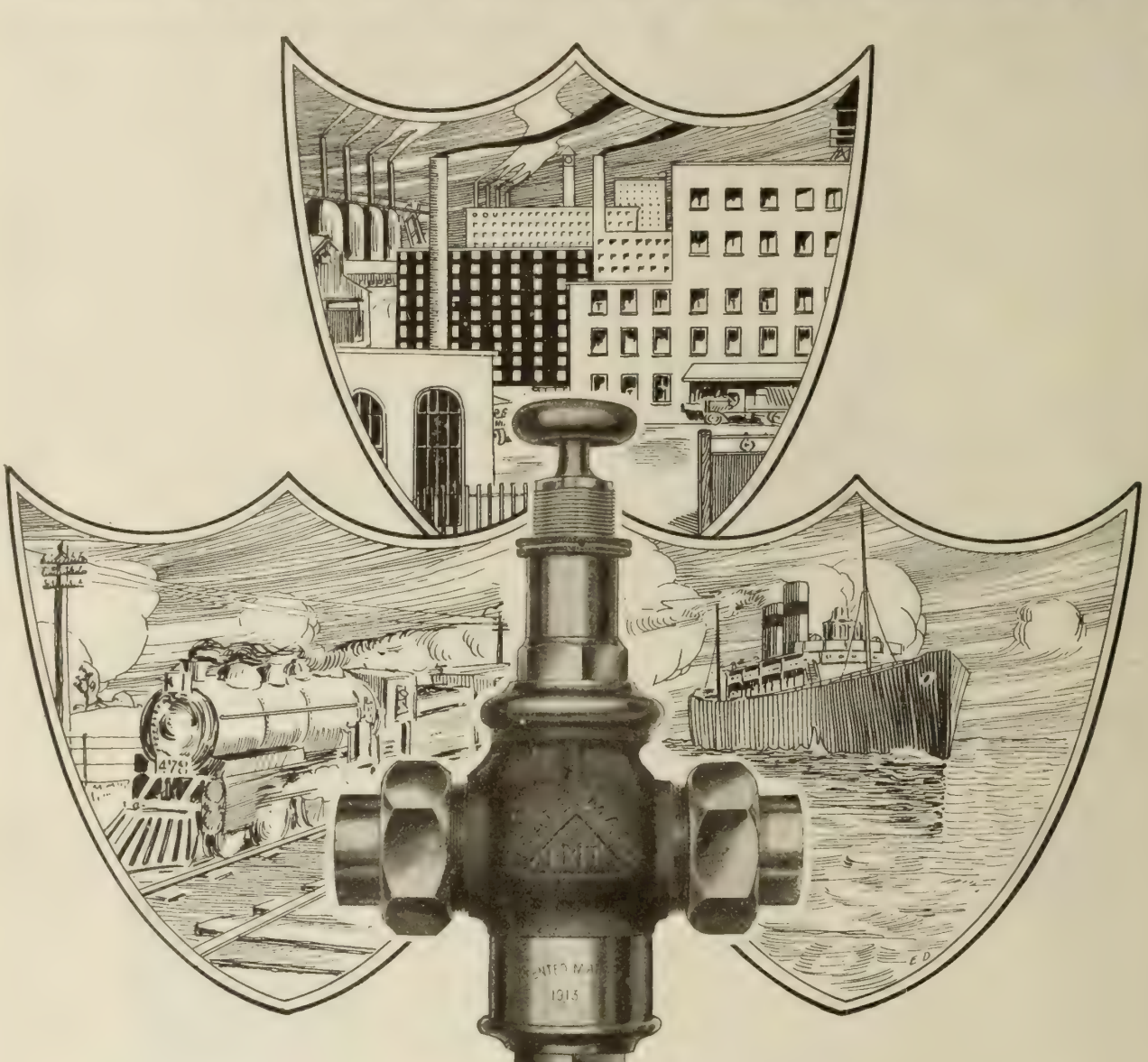
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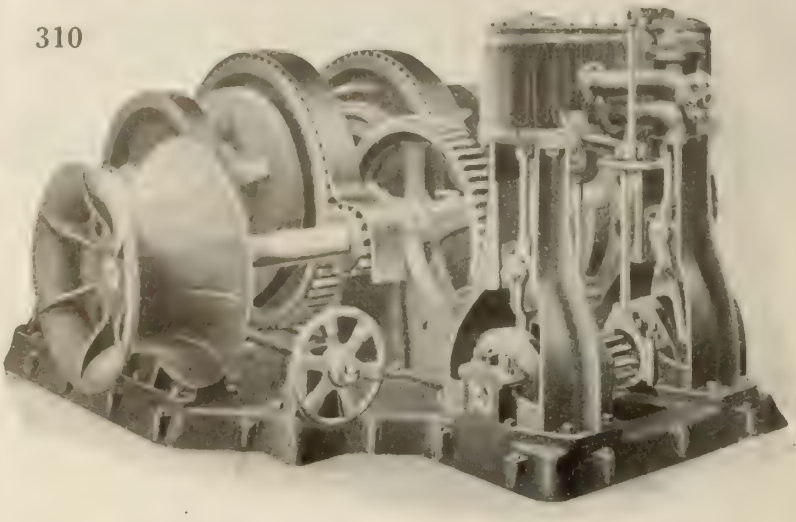
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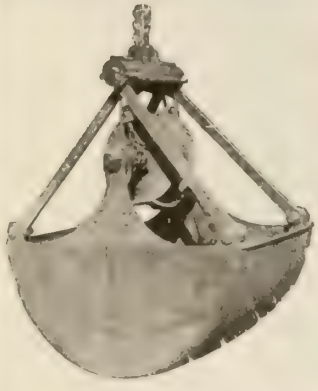
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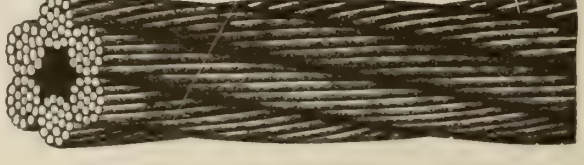
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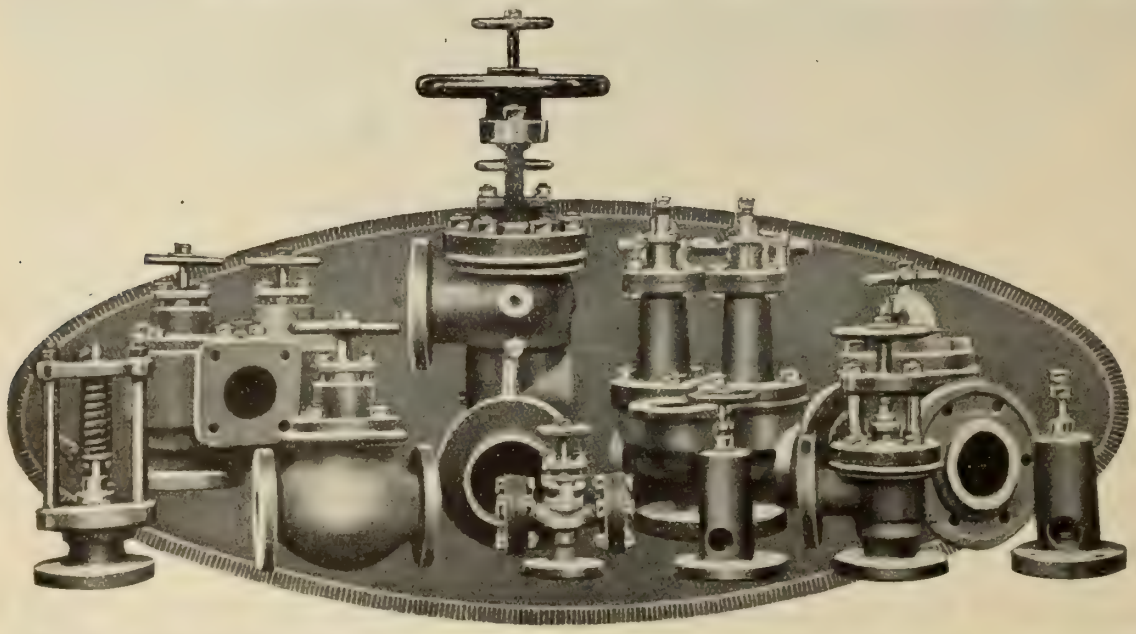
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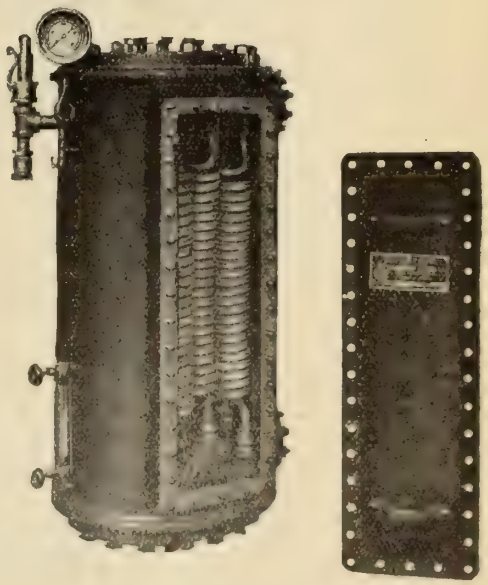
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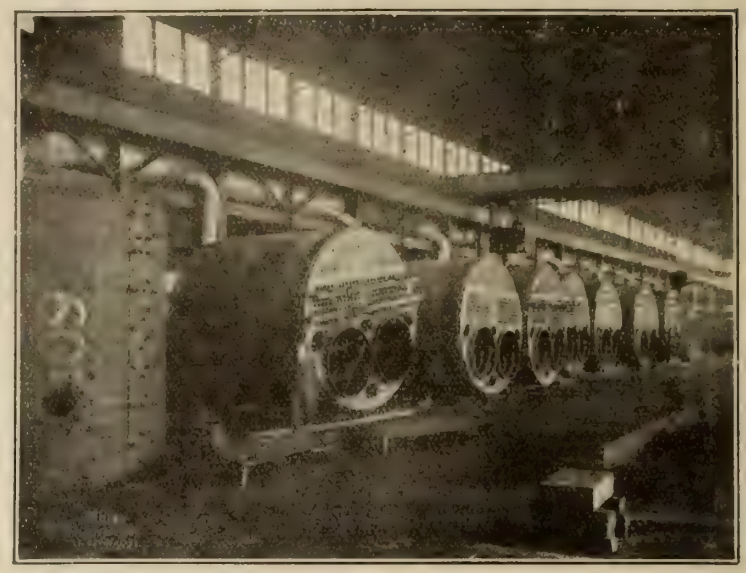
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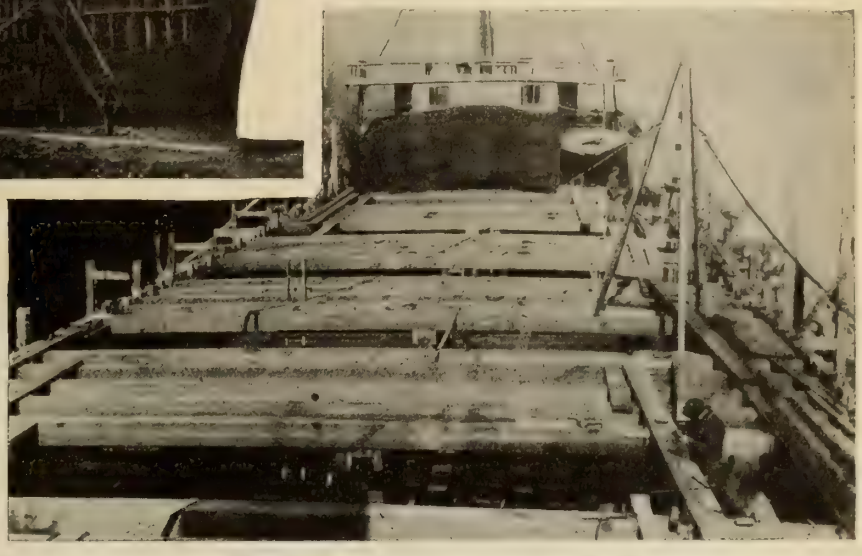
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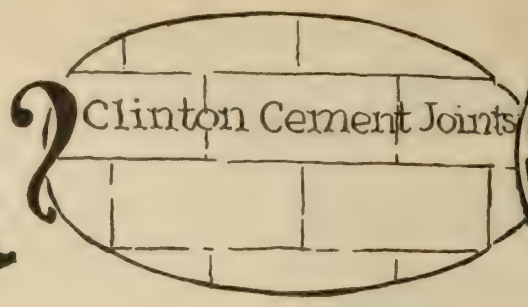
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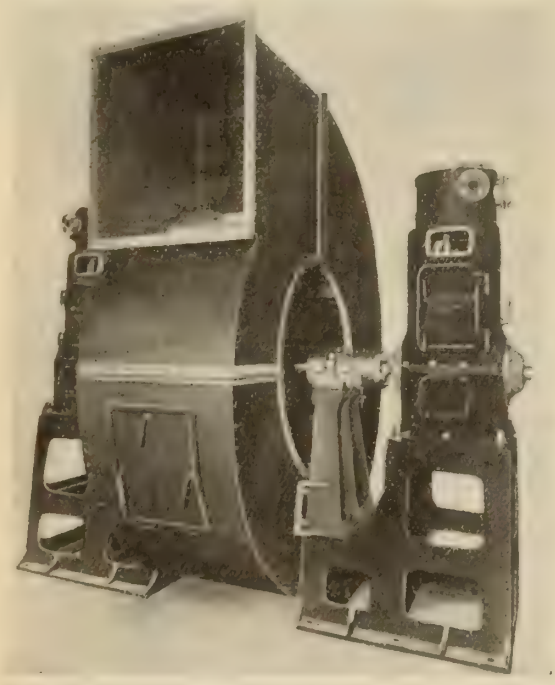
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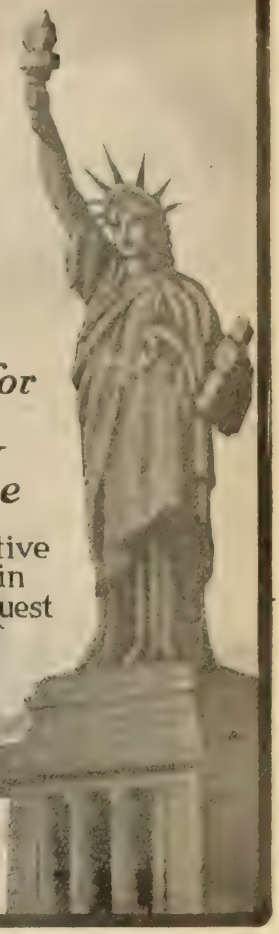
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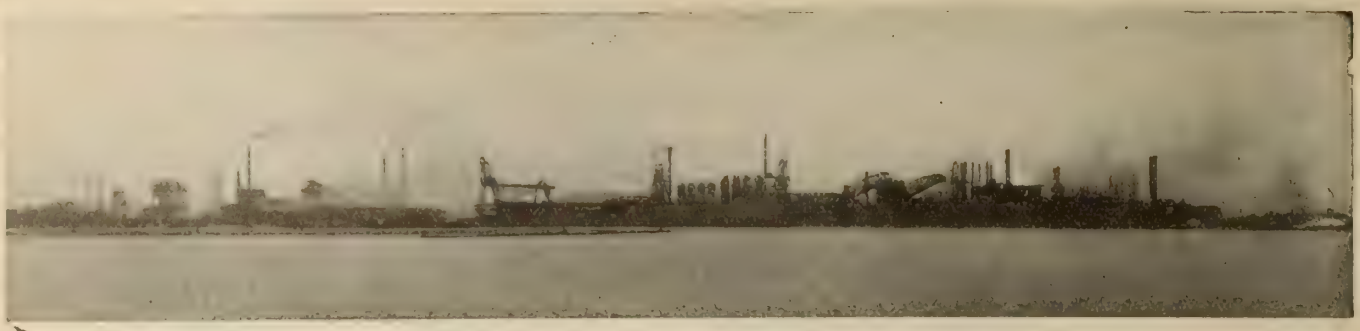
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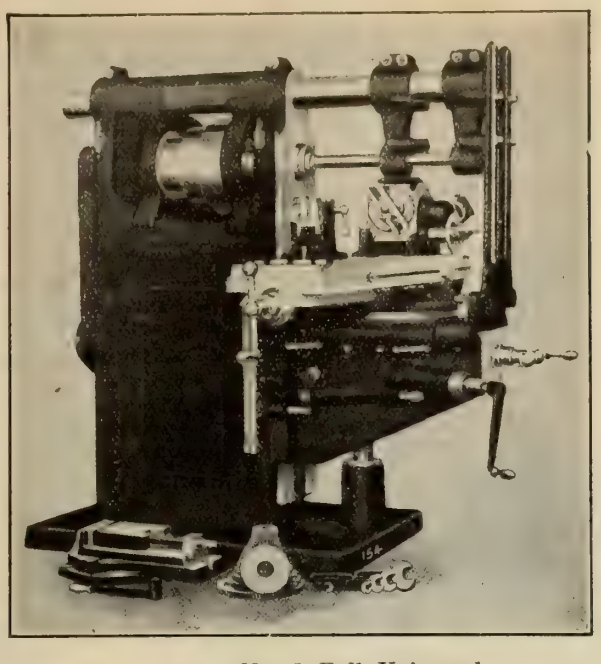
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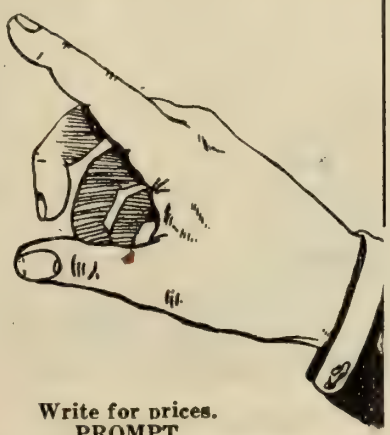
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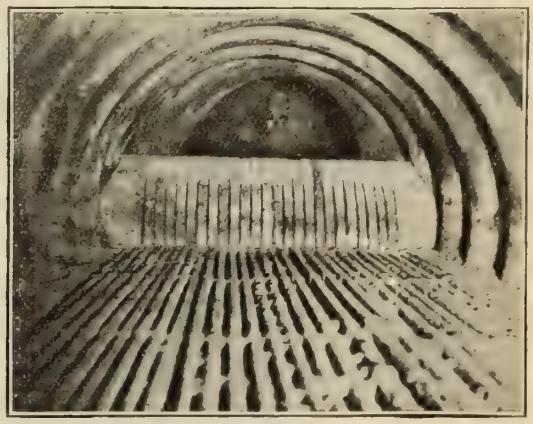
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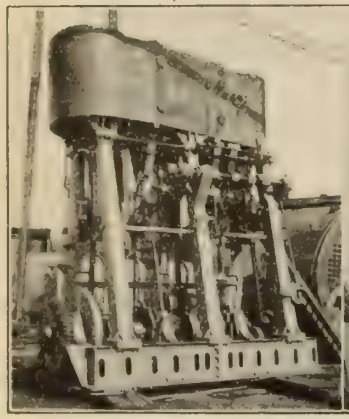
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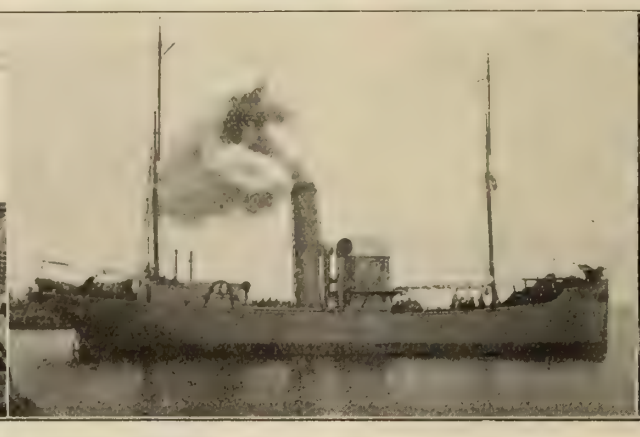
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Volume IX. TORONTO, NOVEMBER, 1919 Number 11

Gearing as Applied to the Marine Turbine

An Interesting Paper Read Before the Institution of Marine Engineers, London, by Mr. John Houston, Member—The Discussion Following Brings Out Points of Importance

WITH the advent of the direct coupled steam turbine into the Merchant Service, the desirability of having some form of reduction gear between the high-speed turbine and the propelled was soon obvious, especially for vessels with a speed of 15 knots or under, and suggestions for effecting this have been formulated in three ways (a) with mechanical reduction and transmission gear; (b) with hydraulic reduction and transmission gear; (c) with electric reduction and transmission gear.

Though the possibilities of such intermediate methods are obviously greater in the case of slow and medium speed vessels, it is not to be inferred from the foregoing remarks that these methods cannot be successfully applied to propulsion of high-speed vessels, as at the present time many of our fastest vessels are being so fitted.

Before discussing in detail the mechanical form of gearing, which has almost superseded the hydraulic and electric forms of transmission, I propose dealing with these latter in a few sentences only.

One form of hydraulic gear, namely, the Fottinger hydraulic and transmission gear, consist of a primary water wheel driven by the steam turbine shaft, which transmits water at a certain velocity through guide vanes to a secondary wheel in the same casing, and in the same axial plane. This secondary wheel is mounted on a secondary spindle connected to the propeller shaft, the diameters of the wheels being so arranged that ratios up to 10 to 1 may be obtained between the revolutions of the turbine and propeller. One of the distinct advantages of this gear is the possibility it affords for obtaining a full power reversing arrangement without special astern steam turbines, by incorporating a second set of wheels of opposite blade angle in an extension of the same casing as the ahead wheels, the water being admitted to the ahead or astern wheels as required by suitable valve arrangement.

There have been many proposals for interposing a generator and motor between a high-speed turbine and the propeller. It would appear from the press that the United States naval authorities are concentrating on this method of propulsion, but it appears to me that there are several objections to it, and these mostly of a practical nature, such as the necessity for the use of high voltages to keep the generators and motors of reasonable size and weight, and high voltages are particularly dangerous on board ship, also the danger of failure owing to the access of water to the electrical machinery. Then the complications arising from having generators and motors to look after as compared with a gear box are considerable, especially when one remembers that Marine Engineers, as a rule, only have a knowledge of electric light installations, and that on a comparatively small scale. They would have to be specially trained in the control of a plant generating and using several thousand horse-power with its complicated accessories. Like the hydraulic system, however, it has the advantage of not requiring a special astern turbine.

The U. S. method is to have the high-speed turbine coupled direct to the generator, and the induction motors are connected direct to the propellers. By cutting out of poles on the motors, the speed of these can be controlled, and this gives the reduction as between the turbine and the propeller.

I recently read a paper on electric propulsion of ships, which was given before the Society of Naval Architects and Marine Engineers in New York, but the writer, in my opinion, did not show any real saving over mechanical gearing either in upkeep or in fuel consumption.

A friend of mine quite lately had the privilege of being on board the U. S. battleship "New Mexico," but I do not think he was greatly impressed by the possibilities of this mode of propulsion, at least for the merchant service. One vessel in the United Kingdom fitted with turbo-electric motors is the SS. "Wulsty Castle,' and in addition, mechanical reduction gear is interposed between the motor and the propeller, the ratio of reduction in her case being 9.4 to 1.

This briefly describes the hydraulic and electric forms of transmission, but the modern trend of thought in this country is particularly towards the mechanical reduction and transmission gear, and this brings us to our subject proper—The helical spur wheel reduction gear as applied to the marine steam turbine.

The success or failure of a geared turbine installation depends on three important factors, viz., design, workmanship, and materials, and it is proposed to deal with these in seriatim.

Design: Of the mechanical form of gearing there are at present two types, commonly known as the "rigid" and "floating" frame gears. Of the latter I cannot say much as I have never actually seen an example, but from what I have read about it, it is claimed that there is a considerable saving in weight, and also that it adjusts itself more readily to the correct pinion alignment. The flexible coupling in the rigid gear allows for this, but perhaps the discussion will give us more information as to the relative merits of the two types.

In order to avoid end thrust on the pinion shaft or on the gear, two pinions and wheels are required, one wheel and pinion having right-handed helices, and the other pair left-handed, the helices being at an angle usually of 30° to the axis of the shaft, although an angle of 45° is favored by some designers. By having a larger angle of helix, a greater number of teeth are in mesh at one and the same time.

To allow of both pairs of pinions and wheels engaging properly, and of the

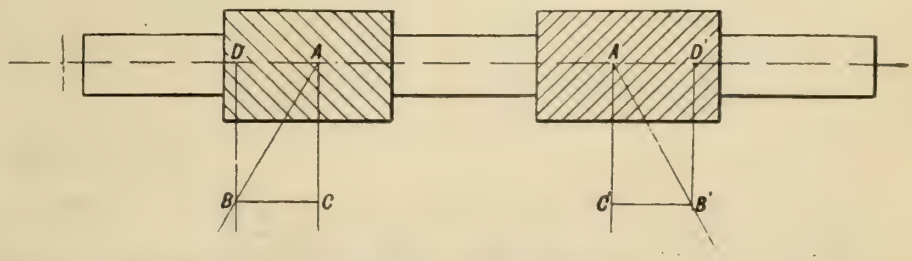


DIAGRAM SHOWING SIDE STRESS.

total forces on the teeth being evenly distributed—a most important point to keep in view—a slight end play is necessary on the pinion shaft. This can easily be seen by giving attention for a few moments to the following figure:

Let the total forces at the tooth contacts, which will be nearly at right angles to the teeth at A and A^1 be represented by A B and A^1 B^1, and they will be at an angle of 30° to the vertical. Complete parallelograms A B C D and A^1 B^1 C^1 D^1, and it will be seen that they are similar. The only axial forces acting on the pinions are A D and A^1 D^1, and if these are unequal the pinion shaft will at once move longitudinally, which it is free to do, until they are equal and the two parallelograms of forces then become equal in every respect.

By this means and with the flexible couplings attached to the pinion shaft, errors of alignment adjust themselves automatically. There are other errors of alignment which may take place, but they will be dealt with later.

As a minimum amount of noise is desirable, a small pitch is essential, and this necessarily means broad teeth, in view of the enormous powers which have to be transmitted with a high pitch line speed, and with a limiting pressure not yet exceeding 1,000 pounds per inch of tooth width.

As already stated, the full breadth of tooth required is divided into two, having right and left-hand helices, and this arrangement also allows of three journals on the pinion shaft, which reduces the tendency to cross-bending action.

The proportioning of the pinion shaft journals is, as a rule, determined by the torque on the shaft, due to the power transmitted, and by the deflection due to the forces acting on the pinions.

This diameter to a certain extent determines the pinion diameter, but the limiting pressure per inch of tooth width has to be taken into consideration, in conjunction with the revolutions of the pinion shaft, keeping in view of course the ratio of reduction desired. The number of teeth also must be such that there is no interference. The pressure per inch of width on pinion teeth varies nearly as $\sqrt{}$pinion diam. in inches, and it has been found in practice that load per inch width of pinion in pounds $\div$ by $\sqrt{}$ diam. of pinion in inches should be approximately 200.

There is a relationship also between the diameter of pinion and width of face of the teeth, as the deflection becomes greater the wider the face, and to decrease the deflection the diameter would require to be increased.

Having decided upon the load per inch of tooth width and the diameter and revolution per minute of the pinion, the width of teeth face necessary to transmit the required S.H.P. can then be obtained.

Any power, however large, could be transmitted, if the reduction gear were made large enough, but if it is too large and heavy it would be useless for propulsion of ships. It calls for a keen judgment on the part of the draughtsman to determine the proportions to give to the gearing to obtain the desired results, and at the same time to keep the weight down to a minimum. As in the designs of most other things, there will be one set of proportions which will be better than any other.

The following simple formula will at once present itself:

Let—

D = Dia. of pinion in inches at pitch line.

L = Total length of tooth face in inches.

p = Average pressure per inch width of tooth face in pounds.

R = Revolutions per minute of pinion.

P = S.H.P. transmitted.

$$\text{Then } P = \frac{\pi D\ R\ p\ L}{12 \times 33000}$$

$\therefore$ P = Const. $\times$ D R p L.

from which any one unknown quantity can be obtained, given the others.

Let us consider for a moment the action of the teeth when in mesh. No two bodies bearing on one another have point or line contact; if they had, the intensity of stress would be infinite. There is always sufficient distortion to bring areas into contact, and in the case of teeth there is actually a very narrow strip in contact. As this narrow strip is difficult to measure, the stress on the teeth is usually not considered in designing helical gearing, the maximum load per inch of width permissible being taken, and this has been arrived at from practical running experience. The presence of lubricating oil keeping the surfaces from actual contact, diminishing friction, and increasing the effectual breadth of the above strip, will greatly increase the allowable load.

The pinion of teeth should be chamfered away at the ends of the tooth faces, and the flanks of the teeth relieved in region of the chambering, and this work should be carried out strictly to gauge.

The idea of this is to overcome the danger of the extreme ends of the teeth being overloaded at the moment of coming into mesh, but this is only considered necessary in the pinions.

To return to our formula, the calculations need only be made for the pinion, as ample rigidity can readily be given to the gear wheel. Its teeth need only be made as strong as those of the pinion, as it is the pinion which will be most affected by wear.

Gear wheels are usually built up in sections, a shaft of forged steel, a centre of cast steel, and a rim of forged or rolled steel.

In addition to rotational stiffness they should be stiff in a fore and aft direction, so that no displacement of the helices will occur. The limiting speed for the gear wheel at the P.C.D. is about 140 feet per second.

The gear casing generally must be so designed that there is rigidity throughout, otherwise some form of misalignment will take place. The bearings must receive proper consideration with a view to oiling and bearing surface, to meet the requirements of the high peripheral speed of the shafts.

It has been mentioned that a small pitch of teeth is essential, and gears which have come under my notice have a normal pitch of .5833 in., which gives a circumferential pitch of .8159 in. It has been found with this pitch that the smallest number of teeth in the pinion should not be less than 25, but 30 is safer. With a less number of teeth than 25, and with a normal pitch of .5833 in., interference of the teeth would take place, with the resultant undercutting. In designing pinions, therefore, atention must always be given to this point. The shape of the teeth is involute, and as is well-known with involute teeth, the line of action or contact is a straight line tangent to the bse circles of the gear and pinion.

It is also well-known that the ratio of the radii of the base circles of two wheels gearing with one another is the same as the ratio of the radii of the pitch circles. If the centres of the wheels be pushed further apart or closer together the wheels will still work correctly together, because this is equivalent to altering the radii of the pitch circles, without altering their ratio.

This is of special advantage in cases where the distance between the centres of two wheels cannot be maintained constant, as might happen in the type of gear we are considering, owing to the wearing of the bearings, or even to the heating of same. If the temperature of the pinion or gear, or both, rises above that of the bedplate the expansion will cause the designed pitch circles to overlap slightly, but this would produce no error in the action of involute teeth.

As temperature has been mentioned I cannot do better than follow on with a few remarks as to the system of oiling of the gears. It is necessary that the supply of oil should be copious, and directed to the proper place. It is usually applied through nozzles and sprayers under a pressure of about seven to 10

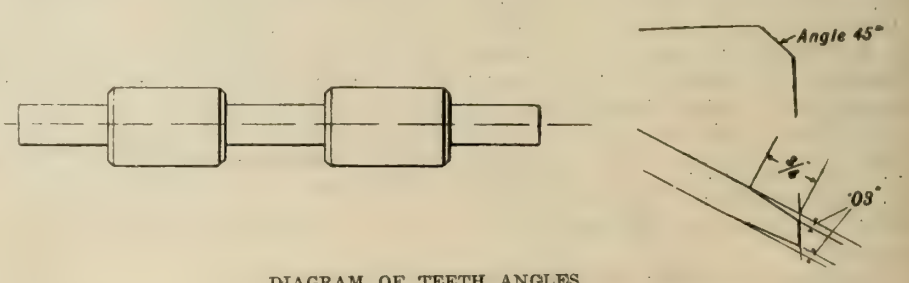


DIAGRAM OF TEETH ANGLES.

lbs., on the gearing at the meshing of the pinion and wheels, so that the oil has not time to be thrown off owing to centrifugal force. In consequence of the high revolution speed of the pinion it will naturally incline to heat, and as is well known, a plunging supply of oil will carry off heat better than an oil bath, and the oil is also kept cooler. An oil cooler is an essential fitting, as if the oil becomes heated, carbonization sets in and particles will gradually be deposited on the tooth with the resulting clogging up of same.

One breakdown of gearing which I heard of in a naval vessel was traced to this cause. The tooth clearances became nil, with the result that the points of the teeth fouled the bottom, the bedplate was fractured, and the pinion wheel teeth distorted and broken.

Mention has been made previously of the cross-bending action on the pinion shaft, but by the universally adopted method of fitting three bearings, at least in single reduction gears, any trouble likely to arise from this cause is very remote. The same can be said about the torsional yield of the pinion shaft. No doubt there is a slight torque on this shaft, but errors due to bending or twisting are infinitesimal, compared with the errors of inaccurate gear cutting, and this brings us to Workmanship.

It has sometimes been supposed that it is sufficient to give the pinion shaft end play, but as we have seen, this only divides the power equally between the two helices, it does not otherwise alter the distribution of tooth pressure. In cutting the teeth of gear wheels and pinions, very great precision is demanded in order to secure silent running and a proper distribution of the load across the whole width of the engaging faces. Extreme accuracy of tooth is therefore another requisite in reduction gears. With the present day demand for reduction gears, it behooves manufacturers to give their attention to the tuning up of their gear-cutting appliances and machines, and I have no doubt that the importance of this is not forgotten.

The teeth are cut usually by a milling process in a "hobbing" machine. The cutting is done by a milling tool called a "hob"; this is a worm, in the threads f which longitudinal gashes are made in form cutting edges. A standard hob is 5½ inches on the P.C.D., the pitch of worm being 7/12 in. which gives the normal pitch of .5833 to the helical teeth.

During construction arrangements should always be made whereby every gear cut can be accurately gauged, and the error, if any, recorded.

Even with the greatest care there will very often be an error to record, but if this does not exceed .001" on a length of 20" or thereabouts of tooth width with teeth set at an angle of 30° to the axis of the shaft, it is found that the gear meshes and runs without trouble, and as this error is greater than any due to bending and twisting, these latter can be neglected. As a rule a very much smaller error than this is recorded. Gears should always be given a bench trial under load, and if the hard spots visible on the subsequent examination are found to be evenly distributed over the teeth very little need be done to them, a slight scraping being all that is considered necessary. Should the hard bearing places be found in line with one another this would point to considerable error, and some drastic would have to be done, but the necessity of accurate cutting of the teeth is understood, and the greatest possible care is taken. It is not advisable that scraping of the teeth should have to be resorted to, to any extent, as the proper rolling circle could not be maintained.

Pitting of the teeth has been noticed in some instances, in gears which have been running over a period, and this, in my opinion, is due to the intense pressure on the hard points, causing the lamination of the material, and the consequent flaking off of same, leaving small cavities or hollows. This in turn will bring other points under hard pressure with the same cycle of action.

This theory of mine may be entirely wrong, but it if is right, it proves the necessity for a smooth finish to the machining of the teeth.

In the machining of the bearings for the pinion shaft and the main gear wheel, every care must be taken to ensure that the axes of both shafts are exactly parallel. Stiff boring bars must be employed and any slight error should be corrected in the final bedding of the bearings and the shafts in place.

As the forces on pinion and gear shafts are much more nearly vertical than horizontal, the rate of vertical wear will be much more than that of side wear, hence we may conclude that if once set correctly the alignment of the pinion shaft will remain fairly correct; this proves the necessity of having the axes of both shafts exactly parallel to begin with.

Special attention must also be given to the adjustments of the bearings, as slackness in these would contribute to want of alignment and would lead to unequal pressure on the teeth. This is a point which applies more particularly to gears which have been running rather than to new machinery, as the question of proper adjustment in the shops will no doubt receive its due consideration.

Another point which might be emphasized is the balancing of the gear wheels, and also the pinions. Just as the most careful balancing of the turbine rotors is essential in order to eliminate vibration, so is the balancing of the gear wheels necessary for the same reason.

But the best of designs and the most satisfactory workmanship will be brought to nought, if the materials are not up to the requirements of the work they are called upon to do. To make use of a metaphor recently originated by a gentleman of whom we have all heard, "One cannot make an 'A1' machine out of 'C3' materials."

For a gear therefore to have a reasonable length of useful service, the very best of materials must be employed. The pinion shaft and pinions are as a rule, made of nickel steel, oil-hardened, with a tensile strength of about 45 tons per square inch, and an elongation of 20 per cent. on a standard test piece. The tyre of the gear wheel can be ordinary 28 32 ton steel, but usually a higher tonnage, say 31-35 tons, is asked for. The other materials used in building up the gear wheel must of course be of the best, and free from all flaws, and the scantlings sufficiently heavy to give the necessary rigidity to the wheel as a whole. There are many proved white metals for bearings, any of which will answer, provided the oil supply to them is kept up.

The life of a gear depends as much on the quality of the materials used in its construction as on the other points which I have emphasized.

Every endeavour should be made to have the materials of as homogeneous a nature as is possible, and absolutely without flaw. Pitting of teeth already mentioned may be due to a lack of homogeneity in material at the tooth surface.

As the pitch is small the teeth are more liable to injury, if roughly handled, than would otherwise be the case, and dents on the pinion teeth will make themselves repeatedly felt in the gear wheel teeth.

Those who are entrusted with the runing of gears must exercise the greatest care that no damage is done to the teeth in overhauling.

The necessity of keeping all foreign bodies outside the gear box need scarcely be emphasized.

Should the lubricating oil supply fail, the teeth will soon be scored and cut, but so long as the necessary oil film is present to prevent metallic contact, the teeth should run well.

In writing the whole of the foregoing I have been thinking principally of the single reduction gear, but these remarks apply equally to the double reduction gear, which is rapidly coming into use. In the latter, the tyre of the first reduction wheel is also usually of nickel steel, oil-hardened, and in the second reduction pinion and wheel some makers employ a larger pitch of tooth, which is 1.2 in. normal as compared with .58 in. in the first reduction.

In it also the width of face of the teeth does not require to be as much as in the single reduction, which allows of a more compact arrangement, and the centre bearing of the pinion shafts can be dispensed with.

The sketches shown give an idea of the arrangement of two forms of gearing.

The SS. Vespasian was the first vessel to be fitted with geared turbines, and she was converted from reciprocating engines for experimental purposes. The ratio of gearing in her case was 20 to 1, the revolutions of the turbines being 1,460 per minute, and the S.H.P. about 1,100. Lately the double reduction has been coming more to the front, with ratios of 45 and 50 to 1, with a corresponding saving in weight and in fuel consumption.

With attention given to the foregoing remarks as to design, workmanship and materials, and to the few possible sources of trouble mentioned, very little diffi-

culty should arise in the running of the gear. In itself it is simple and has few parts, and none which require manipulation in manoeuvring the ship. Also the increased speed of the geared turbine allows it to be greatly reduced in size, and in the rows and number of blades. This combination makes the machinery less complex and simpler, and therefore there is less liability to breakdown. The turbine is highly economical, the gear absorbs little power (about two per cent.), and the propeller can be run at its maximum efficiency.

This high efficiency leads to diminished weight in boilers, and this will allow of a decrease in the weight of fuel for a given voyage. These savings may be utilized to carry more deadweight on a given displacement, or to decrease the displacement for a given tonnage carried, all of which tends to economy.

The weight of machinery of a naval vessel of 40,000 S.H.P. which came under my notice lately, may be of interest. With steam up in the boilers (water tube, oil fired) and including all auxiliaries, stores, etc., but excluding the fuel oil, total weight amounts to 920 tons only, which gives a weight of 51½ lbs. per S.H.P., a combination of weight and H.P. hitherto undreamt of.

From these results one might say with truth that the mechanically geared turbine along with oil fired boilers is the marine prime mover of the moment, and likely to oust all competitors.

The foregoing is "Gearing as applied to the Marine Steam Turbine" as I know it, and I am only sorry that I cannot write on the subject from a practical point of view—I mean from experience gained by actual seagoing conditions. I have had to look at it from the draughtsman's standpoint, and in bringing this part of the paper to a close I am conscious of my limitations, and of by inability to deal with it as fully as it deserves.

The advent of the geared turbine marks a new epoch in Marine Engineering, and as it goes far into one of the most important questions of the day, namely, the conserving of our natural resources, I do not think it could be considered inconsistent with the preceding part of this paper if I add a few remarks on fuel consumption, and draw a comparison between the geared turbine and its predecessors, or even with its contemporary, the Diesel engine.

When one considers that the burning of 1 lb. of Welsh coal per hour generates sufficient heat for the evaporation of about 15½ lbs. of water, which is equal to 15,000 units of heat, or 11,580,000 ft. lbs. per hour, or nearly 6 H.P., the loss of heat energy will be better understood, and one can come to the conclusion, that there is room for improvement.

As even the best of reciprocating engines require about 1½ lbs. of coal per I. H. P. per hour, it is clear that almost 90 per cent. of this available heat is wasted in that type of engine. Compared with this, the geared turbine consumes about 1¼ lbs. per S. H. P. per hour, but before a proper comparison can be made between these, some idea of the relation between I.H.P. and S.H.P. must be arrived at.

It need scarcely be said that I.H.P. is the gross power obtained without allowing for power absorbed by friction, and S.H.P. is the power transmitted to the shaft after overcoming friction. As it is generally taken that about 15 per cent. of the I.H.P. is required to overcome the friction in a reciprocating engine, leaving only about 85 per cent. of the power to be transmitted to the shaft, then the 1½ lbs. per I.H.P. corresponds to about 1¾ lbs. per S.H.P., which shows a saving to the credit of the geared turbine of at least 25 per cent.

It will be seen therefore from the point of view of fuel economy, that the geared turbine is a very considerable improvement on its predecessor. Where oil is used instead of coal the consumption of oil is about 1 lb. per S.H.P. per hour, which is a further saving still.

Or let us consider the matter from the steam consumption side of the question. The ordinary high pressure triple expansion engine requires in the neighborhood of 16 lbs. of steam per I.H.P. per hour = to about 18½ lbs. per S.H.P. per hour, the direct coupled turbine requires about 13 lbs. per S.H.P. per hour, the geared turbine about 11 lbs. per S.H.P. per hour. Expressed in adiabatic efficiencies, these would be 36 per cent., 51 per cent., and 61 per cent. respectively.

The mention of fuel oil naturally makes one think of the Diesel engine, and one must confess at the outset that from the consumption per S.H.P. or B.H.P. point of view, the Diesel engine compares very favorably even with the geared turbine, the consumption being only about .47 lb. per P.H.B. her hour.

The greatest loss of heat energy in the steam engine is of course in the condenser, and this is where the Diesel engine has the advantage, developing as it does its power from the fuel directly in the cylinder.

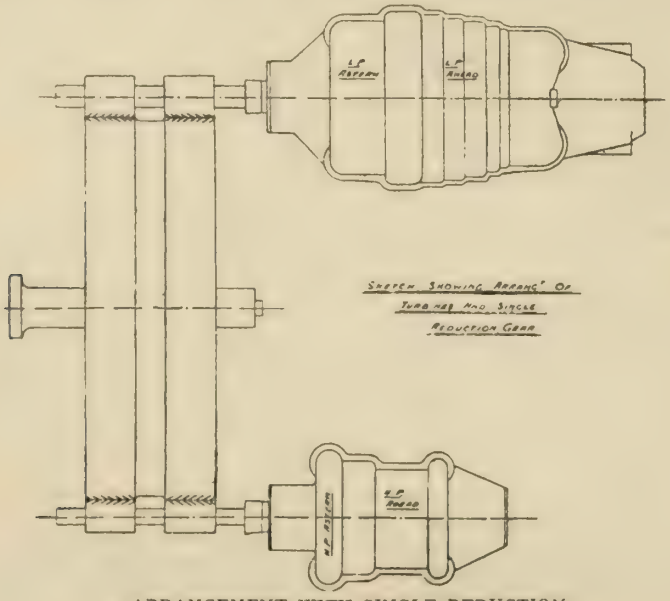
But the Diesel engine has not yet been brought to that state of perfection where the weight of the machinery works out at about 50 lbs. per B.H.P.—in its case it is in the region of 200 lbs. per B.H.P. for mercantile vessels—and I am sure you will all agree that where large powers are required the geared turbine either in single or double reduction is an easy winner.

With superheated steam again coming into general use in combination with geared turbines, with the consequent economy in fuel and water consumption, a great attraction is held out to builders and owners to fit their vessels with this system, and this is apparent by the number of vessels on order being thus equipped. It will be interesting to watch their performances on service, and if the results of these were published the information would be useful and instructive to one and all of us. It may be interesting in passing to observe that there is a saving in consumption of 1 per cent. for every 10° of superheat. This is a generally accepted figure up to about 120° of superheat, when the saving gets gradually less. At 200° superheat the saving is about 18 per cent.

The Chairman: Pitting of the teeth of the gears has been mentioned, and Mr. Houston attributes this to intense pressure on the hard points causing the lamination of the material. He may be right but there should not be any hard points. Later on he draws attention to the fact that the material should be homogeneous, and that pitting may be due to the lack of this.

The pitting of gears I have seen was on every tooth for their whole length, and I am inclined to think air bubbles in the oil were the cause of the pitting, but it did not appear to me to be a very serious trouble, in fact one might look upon a moderate number of pit holes as being receptacles to hold oil.

The power, when using the Fottinger Transformer, is transmitted through water (which, by the way, becomes heated, and the heat is transferred to the feed water) and with mechanical gears



ARRANGEMENT WITH SINGLE REDUCTION.

we should endeavour to get as much of the load carried by the oil as possible and thus relieve the metal.

Mr. Houston's figures of comparison between geared turbine and Diesel engines do not go far enough and are hardly fair to the Diesel engine. When comparisons are made one has to bear in mind weights of fuel carried, as the efficiency of a ship is to leave a port with the maximum amount of cargo.

Let us take Mr. Houston's figures for two vessels of equal dimensions, one geared turbine, one Diesel, each with 3,000 b.h.p.

The weights of machinery will be:—
G.T. $=3,000 \times 50=150,000$ lbs.
Diesel $=3,000 \times 200=600,000$ lbs.
The fuel consumption will be:—
G.T. $=3,000 \times 1.25=3,750$ lbs. per hour.
Diesel $=3,000 \times .47=1,410$ lbs. per hour.

And if the ship is say 500 hours on the voyage, the total fuel burnt will be:
G.T. $=3,750 \times 500=1,875,000$
Diesel $=1,410 \times 500=705,000$
so that the ships would leave port with:

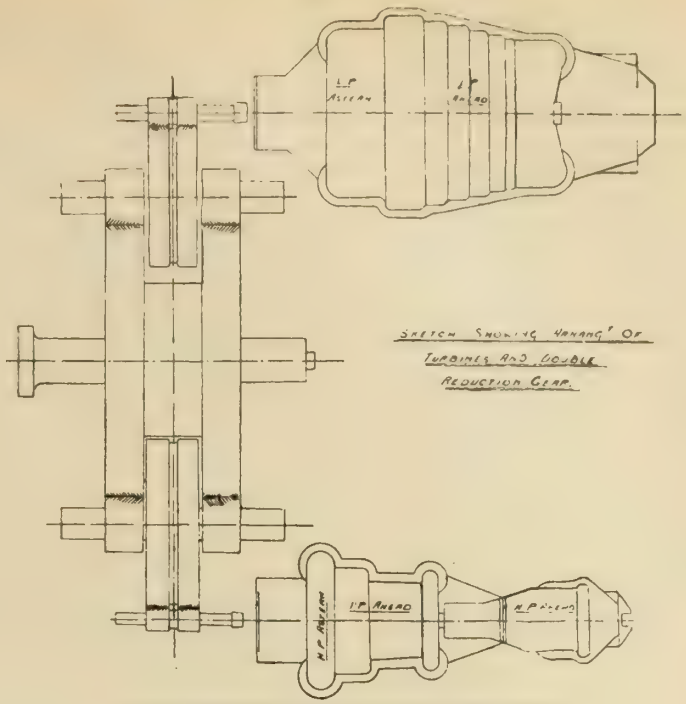
G.T. weight of machinery	150,000 lbs.
G.T. weight of fuel	1,875,000 lbs.
Total	2,025,000 lbs.
Diesel weight of machinery	600,000 lbs.
Diesel weight of fuel	705,000 lbs.
Total	1,305,000 lbs.

or a saving in favor of the Diesel engine of 720,000 lbs. or 321 tons.

We are indebted to Mr. Houston for his paper, and we shall be glad to have criticism from our sea-going members as they can very probably enlighten us on many of the points raised.

Mr. J. Shanks: In order to save valuable time in discussing this excellent paper, I may start the ball rolling in the hope that members present who have experience with geared turbines will give us the benefit of their knowledge and thereby add to the value of the paper. It was a happy thought of our Hon. Secretary to arrange the reading of this paper to-night in view of the visit of members to the Power Plant Works at West Drayton on Saturday next, where they will have an opportunity of seeing the most modern methods of gear cutting.

Personally, I have no experience with geared turbines, but the rapidity with which gearing has been successfully applied in marine propulsion within recent years has made it apparent to all marine engineers that it is a subject they must become thoroughly conversant with. The author has drawn our attention to the great importance of accuracy in the pitching of the gear in order to ensure successful results and even then a slight end play must be allowed on the pinion shaft to make alignment perfect, and this of course necessitates the introduction of a flexible coupling between the pinion shaft and the turbine. I should like the author, or any member present, to give us their experience as to tear and wear on the gearing itself and the flexible coupling. Personally, I have heard most contradictory reports, some



ARRANGEMENT WITH DOUBLE REDUCTION.

describing tear and wear to such an extent as to cause serious trouble within a year or two, and others that there was no perceptible wear after years of work; probably both are true. But no doubt, with more experience and improvements in gearing, present difficulties, where they occur, will be overcome. Up to the present the turbine has only been applied to ships with speeds over 15 knots, but with the introduction of a reliable double reduction gear having a ratio of 45 or 50 to 1, I can foresee a great future for their adoption even in tramp steamers.

The author has drawn our attention to the gain in weight of machinery and economy in fuel as compared with the reciprocating engine, and few, I think, will seriously dispute his figures; but first of all we must have reliability; when that is assured, the coming of the turbine with double reduction gear in all class of ships will follow. I beg to thank the author for his valuable paper and look forward to an interesting and instructive discussion.

Mr. R. Balfour: Some of us have been anxiously waiting for a paper on the subject so ably presented by Mr. Houston to-night. At no time in our history has gearing claimed our attention more than at present, especially in connection with the advent of steam turbine power.

My experience has been confined to single reduction gear in land installations requiring only moderate speeds; still it has been sufficient to convince me that extraordinary care and accuracy are needed to ensure success. Assuming that the materials and workmanship are of the best, and the adjustments are mathematically correct before leaving the factory, we are yet confronted with serious trouble as regards the durability of the teeth. In my opinion some of the causes of failure are due to rough pitch, excessive tooth pressure, want of definite forced lubrication at point of meshing, quality and temperature of oil, and inaccuracy of adjustment of pinion shafts in relation to wheel shafts whether with floating or rigid gears.

I merely got up to congratulate my colleague for his able and interesting paper, and I think the thanks of the members are due to the Committee of Lloyd's Register for again allowing one of their staff to come and give us the benefit of his knowledge and experience.

Mr. Calderwood (Power Plant Company): No mention has been made of the gear shaping process of generating teeth. This method compares favorably with the hobbing method, and up to certain sizes seems likely to supersede the hob, and it is worthy of being noted in a discussion on the subject introduced by the author. No details or description of the methods used to determine the amount of error in the teeth, either for pitch, shape or lead is given, these are important and of interest to engineers. It may be doubted as to the correctness of the remark that pinions are usually made of nickel steel and oil hardened, owing to the extreme difficulty of preserving the teeth from warping during hardening. My experience is that pinions are made of nickel steel, heat treated to toughen them before cutting the teeth. Mention had been made that the pinion has lateral play when under load. It seems to me that this can only arise in the case of faulty cutting where the plane containing the apices of the teeth is not at right angles to the shaft axis. If the cutting helices are accurate the pinion should remain without movement. Mention has been made of the floating frame for pinions; I presume that the Melville-MacAlpine system has been in view, and I venture to think that this system is somewhat costly to install, and intricate in operation. Our company is introduc-

for a spring bearing of simple design, of which the same results as were obtained by the floating frame are expected. Such systems demand flexible couplings, and if I might reply to a previous remark in the discussion I do not know of a failure with the claw type flexible coupling on shipboard. As it is the intention of the members to visit the Power Plant Company's Works on Saturday, I hope to show to the visitors gearing of the double reduction type under construction (as shown on the blue print handed round by the author) and also the gear shaping process in operation.

Mr. J. Thom: The application of gearing for large powers is comparatively a new industry, at least where sizes have to be kept down as much as possible owing to confined space on board ship. The deep cut gearing requires large diameter wheels to give the best results, the opposite of what is possible on ship board.

The smaller the teeth, which will give the strength necessary, the more satisfactory the gearing will run. I am of opinion when hardening or toughening the teeth in large wheels has been perfected the life of the wheels will be greatly increased, even so to harden the pinions alone would give much improved results.

Lubrication under pressure is absolutely necessary after oil has been cooled. We are looking forward to our proposed visit to West Drayton, where doubtless we will see this kind of work carried out with mathematical precision.

Mr. W. McLaren: The author brought forward a paper on Gearing as applied to Marine Steam Turbines, which is certainly of special interest to Marine Engineers. But I would beg to remind him that, although Marine Engineers, as a class, have not had actual trade experience with heavy electrical power units, they have not failed to overcome the running and maintenance of many complicated machines on board ship, electrical or otherwise.

We had a valuable paper read on electrical ship propulsion by one of our members, Mr. Durtnall, several years ago, and I hope and trust it will be found as time goes on the Marine Engineer is not found wanting for his opportunities, considering the special gearing dealt with by the author as pinion and spur gears. I should like to know which side of the gear he recommends, the flexible couplings, that is the turbine side, or the propeller shaft side, as I understand the flexible coupling is close on the gears and would say the rigid gear with three bearings where there is a right and left-hand and helices, pair of pinions, but if in one pinion, certainly a bearing each side of pinion, and when I say rigid I mean that the pinion and spur wheels are in one independent frame or bedplate, with adjustment for alignment of pinion and spur bearings when wear takes place. Having since been privileged to visit the Power Plant Company's Works and seen their production to the methods they apply to actual gear cutting for heavy power units, land and marine purposes, I cannot see the need to introduce a floating gear pinion especially with a helical cut gear, as any allowance for a floating action must be in the flexible coupling on the turbine side, as end play is not desirable with a turbine rotor, yet has no disadvantage on the propeller or thrust shaft side. I cannot agree with the author in his fuel or steam consumption with the turbine engine, 15½ lbs. water per 1 lb. of Welsh coal is more theoretical than practical. I may mention we have had Durham coal with as high a calorific value as Welsh coal. Has this steam consumption been corrected by the weight of condensed water? And also is the consumption of steam and weight of auxiliary machinery taken into account that is necessary for the circulating and vacuum pumps with Naval and Mercantile Marine practice?

Mr. Houston: I think Mr. Shanks set the ball a rolling, so I shall begin my reply by discussing the various points he raised, and then proceed with the questions of the other gentlemen who have spoken. Mr. Shanks asked about the fore and aft allowance of movement in the pinion shafts; what wear there is on the teeth, and also what wear, if any, takes place in the flexible couplings. I think I made it clear that the fore and aft movement given to the pinion shafts is to allow the pinions to accommodate themselves to the opposite angle of helix of the gear wheels, but this allowance is a mere fraction, about .020 to .030. This movement also takes up slight inaccuracies in the cutting of the teeth, mentioned by Mr. Shanks. The wear that takes place on the teeth is negligible if the oil supply is kept up, and with a properly designed flexible coupling of the claw pattern, there should be little or no wear. Mr. Shanks enquired as to whether double reduction gears were being fitted to tramp steamers. In my experience I have only come in contact with single reduction gears for low powered vessels, but it is quite within the bounds of possibility that double reduction gears will be fitted into tramp steamers just as they are at present being fitted into liners, as the saving in weight and in consumption is very considerable. I recently saw a design for a 750 S. H. P. double reduction set, which was got out for demonstration purposes, and the weight of machinery and the room it occupied were almost absurdly small as compared with a reciprocating engine.

The gentleman from the Power Plant Co. had some very interesting remarks from queries to make, and in view of the proposed visit to this Company's works on Saturday, his presence here to-night is very opportune. He raises the point of the generation of the teeth by the shaping process, as against the "hobbing" method. I've no doubt the shaping process gives satisfactory results, or it would not be employed, but, as I have not seen the operation I am not in a position to compare the two methods. The method of testing the accuracy of the gear cutting could be better explained by practical demonstration than by description, but I shall endeavor to give some idea of how it is done. The pinions to be gauged are set up in V blocks on a surface table, and two points are selected, say 20 pitches or so apart, on the teeth, and on the line of the axis of the shaft. These points can then be measured by a Vernier gauge, and the distance apart compared with measurement made up by the axial pitch of one tooth multiplied by the number of pitches taken. In the case of the pitch of the teeth which we have had before us, viz.: .5833 normal and .8159 circumferentially, the axial pitch works out at 1.1429 in. This multiplied by say twenty pitches give a measurement to compare with a Vernier reading over twenty pitches, and the error, if any, can then be seen and recorded. It was interesting to hear about the Power Plant Company's spring bearings and to learn that they give satisfaction. This idea adds to the different designs already quoted; the rigid which we have considered, and the floating frame which was mentioned.

Mr. Newton and Mr. Thom both enquired about the oil hardening or toughening of the nickel steel pinions, and were of opinion that any heat treatment would cause distortion of the teeth. I am in agreement with them on that point, but the nickel shafts and pinions are treated when rough turned and machined almost to finished sizes, and before the actual cutting or shaping of the teeth takes place. Mr. Thom also enquired about the amount of end play on the pinion shaft. This question was answered in my reply to Mr. Shanks.

Mr. McLaren raised the point as to the advisability of fitting a flexible coupling between the main gear shaft and the thrust shaft, but I have never heard this suggestion being put forward as necessary. The flexible couplings between the turbines and the pinion shafts are fitted primarily to allow of the slight fore and aft movement of the pinion shafts, whereas there is no necessity for any movement in a fore and aft direction of the main line shafting. Rather, the main line shafting and the main gear-wheel shaft should be so lined off and coupled together to ensure perfect rigidity throughout. He also rather doubted the consumption of 11 lbs. per S. H. P. as compared with 18½ lbs. for reciprocating engines, but that is an actual figure obtained on the full power trial of a 40,000 S. H. P. naval vessel. In fact it is an "all on" figure, including auxiliaries, the turbine consumption was about 9 lbs.

To those of us who have been writing and speaking on this subject from the theoretical side, it was interesting to have the remarks of the gentleman who had been at sea in a geared turbine vessel, and who could speak with first-hand knowledge. He puts forward the suggestion that the pitting of teeth sometimes met with, is due to the presence of salt water in the oil, and he explained that the oil is often collected from the bilges and separated and certain amount of salt water goes through with it. If

this is actually done it is a most reprehensible practice in my opinion, and in most instances of breakdowns of the gearing the cause can usually be traced to a defect in the oil supply system, or in the class of oil used. It is probably not too much to say that the maintenance of a copious supply of oil on the gearing is the most important matter necessary to the successful operation of a marine geared-turbine installation.

In his remarks he stated that the temperature of the oil was kept at about 110°, which would be quite satisfactory, but even this temperature shows the necessity of passing the oil through oil coolers.

Mr. Balfour was of the opinion that the wear on the teeth and on the flexible couplings was due to the load not being constant or steady, and he attributed this to the number of blades on the propeller. Personally I do not see that this has much bearing on the point, but I am in agreement with him on the desirability of having a steady load. Shocks or a repetition of shocks, as one would get in an uneven load, will always bring wear in their train, but I contend that under normal running conditions the load is fairly constant. This brings us to a point raised by Mr. Corns when he enquired if any bad effects were met with, due to the engines racing.

It was my good fortune to be on board the SS. Vespasian on several occasions not very long after she was converted with geared turbines, and whilst she was trading across the North Sea in all weathers between the Tyne and Hamburg. The engineers reported that they did not know they had engines on board in heavy weather; rather a difference from the hair-raising experiences some of us no doubt have had with reciprocating engines. I can corroborate Mr. Corns' statement that the machinery of the SS. Vespasian is now in a tramp steamer called Lord Byron, as this vessel was recently in Barrow, when I took the opportunity of calling on board knowing that the transfer of machinery had taken place. I was informed that it was still going strong.

In reply to Mr. Beckett, the turbine itself is prevented from fore and aft motion, thereby bringing the rotary and fixed blading into contact, by fitting a small thrust block, usually nowadays of the Michel type, on the rotor shaft. The main line shafting still requires of course the thrust block in the usual way. The main line shafting may be slightly altered from the alignment owing to the method of loading the vessel, but this slight alteration in the shape of the vessel should not affect the gear case which, in a fore and aft direction, occupies comparatively little space.

With reference to our Chairman's remarks, the only vessel which I know of fitted with a "Fottinger" transmission gear, was a little vessel called Holzapfel I. Her motive power was a suction gas engine, but I do not think it gave satisfaction, and I understand it ultimately gave way to a steam engine, and I suppose the "Fottinger" transmission gear would go with it. It is difficult to say offhand as to the amount of wear permissible on gear teeth; one would have to consider each individual case on its merits. As to the method of lubricating the gear, in my opinion the best method is to supply the oil under pressure, through nozzles or sprayers distributed along the width of tooth face, and immediately at the meshing of the gear and pinion. Mr. Fielden advances the theory that pitting of teeth may be due to air, but I am inclined to keep to the opinions expressed in the paper, as air is present in all gear cases, but pitting does not take place in every instance. The reason for employing harder steels in the pinions than in the gear wheels is because of the heavier work coming on the pinions due to the difference in speeds and diameters.

I am in agreement with Mr. Fielden in his remarks about the Diesel engine, but you will notice I exclude the fuel oil from the weights, and I distinctly say where large powers are required. The highest powered Diesel engined vessel that I have heard of is in the region of 6,000 B. H. P., so I still contend that the geared turbine is the winner. I think these remarks of mine deal with the various points raised, and I am glad we have had such a good discussion.

Capt. P. T. Brown (By correspondence): The subject of geared turbines is so important that I think Mr. Houston has performed a splendid service in bringing it before the Institute, and I hope, with him, that the discussion may be the means of inducing those in the know to impart to us a little of their experience.

In regard to the hydraulic system I trust some member may be able to give some detailed information. Previous hydraulic systems of propulsion, e. g., H. M. S. Waterwitch, were not successes, but I am of opinion that a useful turbo-hydraulic system would possess certain peculiar advantages over mechanical gearing. Weight would probably be reduced, and the simplicity in construction of water wheels as compared with gear-wheels would help from the cost point of view. Running costs—in view of the lubrication saving—would also probably be considerably less.

Electrical systems for mercantile service are, I fear, without the range of practical consideration. Without doubt successful running would entail the necessity of carrying electrical as well as steam engineers, and we all know the view a shipowner takes when increase in personnel is asked.

The author's descriptive matter of mechanical gearing leaves little room for criticism. He has expounded the fundamental principles of design most clearly, but I should have liked a little more about the lubrication system and also about the oil. The noise made by gearing is a very important consideration in passenger ships. I have been told that the engine-room of the Vespasian was not exactly quiet, in fact the reverse. Some 5 or 6 years ago I surveyed, during construction, the machinery of three geared turbine ships. The noise in the engine-room on the trial trip of the first was very great. Experimenting with oil gave splendid results, and the noise on the trials of the third ship was no greater than one would get in an ordinary turbine engine-room.

I should be glad if Mr. Houston would confirm his figure for the limiting speed at P. C. D. of the gear-wheel. 140 ft. per second seems to be rather high. Mr. Houston's theory as to the pitting of teeth is very interesting, but in searching for an explanation of the phenomenon I would rather he had eliminated the possible chemical effect of the oil.

I am sorry to disagree with anything in a most valuable paper, but I fear the author's figures for consumption of other types of propelling machinery are rather higher than is found in really good practice. There are many reciprocating jobs running on less than 1½ lbs. per I. H. P. hour, and in regard to the use of an exhaust L. P. turbine I know a case where, for all purposes, on a round voyage the consumption worked out at not far from 1 lb. per S. H. P. hour. Large sets of marine Diesel engines in my experience use only .39 lb. per B. H. P. hour.

I would especially congratulate the author for his discrimination in pointing out that to effect economy is to "conserve our natural resources." That is the real spirit. Saving of fuel is of more importance to us as a nation than the saving of a shipowner's coal bill. But our problem needs to be analyzed further. We must simplify the means by which we effect the saving and my own idea is that we shall only make real progress when we cut out links in the chain from fuel to propulsive effort. The geared turbine introduces a link, the oil engine cuts one out.

Workmanship in helical gearing, as the author points out, must be of the highest order, and the extension of the system will, I hope, induce marine engine builders to adopt better machine and workshop practice. Almost insane competition amongst marine engine builders and others recently led to the introduction of rough methods and practice which needs reform. To carry the quoted metaphor still further one cannot construct an A1 machine by C3 methods.

In conclusion, I would like to congratulate the author on his paper and to thank him for it.

Ottawa.—By a recent act passed by the Parliament of Great Britain, all vessels sailing from a U. K. port, under the British flag, must carry a wireless installation, and wireless operators. This will apply whether the vessel is registered in Great Britain or one of the Dominions, if the vessel is of 1,000 gross tons or over. The act will come into force three months after the expiration of the Defence of the Realm Act, by the declaration of peace.

LLOYD'S REGISTER SHIPBUILDING RETURNS

For Quarter ended Sept. 30, 1919

THE tonnage building in the United Kingdom at the end of September, viz., 2,816,773 tons, shows the large increase of 293,000 tons as compared with June, and is over 1,070,000 tons more than the work in hand 12 months ago.

The largest increase has taken place on the Clyde, in which district there are now 992,298 tons under construction.

The total "commenced" during the quarter amounts to about 714,000 tons, and includes many large vessels. There are now building 151 vessels of 6,000 tons and upwards, as compared with 129 at the end of June. The vessels of 10,000 tons and upwards amount to 42.

The output during the quarter, however, shows a decrease of about 112,000 tons, as compared with that of the previous quarter.

The total building abroad—5,231,809 tons—is about 262,000 tons lower than the total building at the end of June; this is due to a considerable decrease in the tonnage building in the United States.

The figures for Italy include the work in hand at Trieste amounting to 110,000 tons.

In Holland there is an increase of 69,000 tons, and in France of 65,000 tons.

The world's total—8,048,582 tons—is about 31,000 tons higher than the figures recorded for June.

The tonnage of vessels actually building under the supervision of the Society's Surveyors, and intended to be classed with Lloyd's Register, amounts to 4,835,000 tons, viz., 2,250,924 tons in the United Kingdom, and 2,583,881 tons abroad. The total figures form a record, and show an increase of nearly 130 per cent. on the highest total ever reached in pre-war times.

In the returns given below warships are not included, nor are figures relating to Germany, complete totals from that country not being yet available.

MERCHANT VESSELS UNDER CONSTRUCTION

The returns compiled by Lloyd's Register of Shipping, which only take into account vessels of 100 tons gross and upwards, the construction of which has actually been commenced, show that there were **781 merchant vessels of 2,816,773 tons gross** under construction in the United Kingdom at the close of the quarter ended Sept. 30, 1919. The particulars of the vessels in question are as follows, similar details being given for the last quarter for the purpose of comparison:—

TABLE I.

Description.	Sept. 30, 1919 No.	Sept. 30, 1919 Grass tons	June 30, 1919 No.	June 30, 1919 Gross tons
Steam.				
Steel	723	2,796,154	701	2,489,820
Ferro-Concrete	8	2,482	10	2,456
Wood and composite	8	2,293	8	2,293
Total	739	2,800,929	719	2,494,569
Sail.				
Steel	29	6,749	35	9,873
Ferro-Concrete	13	9,095	28	19,608
Wood and composite	..	.....	..	.....
Total	42	15,844	63	29,481
Total steam and sail	781	2,816,773	782	2,524,050

The tonnage now under construction in the United Kingdom is about 293,000 tons more than that which was in hand at the end of last quarter, and about 1,070,000 tons more than the tonnage building 12 months ago.

Of the merchant vessels being built in the United Kingdom at the end of September, 617, of 2,250,924 tons, are under the inspection of the Surveyors of Lloyd's Register, with a view to classification by this Society.

OTHER DETAILS

The following details concerning the ship-building work of the United Kingdom during the past three months may be added:—

TABLE II.

During Quarter ended Sept. 30, 1919.	Steam No.	Steam Gross tons	Sail No.	Sail Gross tons
Vessels commenced	171	711,302	11	2,625
Vessels launched..	142	404,714	20	11,331

MERCHANT VESSELS UNDER CONSTRUCTION IN THE WORLD

TABLE III.

Where Building.	Steam No.	Steam Gross tons	Sail No.	Sail Gross tons
United Kingdom ..	739	2,800,929	42	15,844
*Other countries...	1,366	5,011,675	181	220,134
Total for world...	2,105	7,812,604	223	235,978

*Excluding Germany, figures for which country are not yet available.

WORK IN HAND IN PRINCIPAL DISTRICTS

The following table gives the total figures for vessels now under construction in some of the principal shipbuilding districts of the Country, as compared with those for the last quarter. Each district, of course, includes places in the neighborhood of the port after which it is named.

TABLE IV.

District	Description	Sept. 30, 1919 No.	Sept. 30, 1919 Gross tonnage	June 30, 1919 No.	June 30, 1919 Gross tonnage
Barrow, Maryport and Workington	Steam.	7	55,295	6	28,865
	Sail...	...	.....	...	.....
	Total..	7	55,295	6	28,865
Belfast and Londonderry	Steam.	37	312,350	40	318,100
	Sail...	...	.....	4	2,700
	Total..	37	312,350	44	320,800
Glasgow	Steam.	158	637,978	153	541,797
	Sail...	13	4,075	19	5,565
	Total..	171	642,053	172	547,362
Greenock	Steam.	74	347,445	77	343,305
	Sail...	4	2,800	4	2,800
	Total..	78	350,245	81	346,105
Hartlepool	Steam.	18	77,320	19	76,450
	Sail...	...	.....	...	.....
	Total..	18	77,320	19	76,450
Hull	Steam.	76	66,173	78	51,685
	Sail...	4	648	9	1,574
	Total..	80	66,821	87	53,259
Liverpool	Steam.	29	71,765	31	58,395
	Sail...	1	260	...	.....
	Total..	30	72,025	31	58,395
Middlesbro' and Stockton and Whitby	Steam.	53	226,205	45	161,920
	Sail...	2	1,360	2	1,360
	Total..	55	227,565	47	163,280
Newcastle	Steam.	110	536,960	100	498,294
	Sail...	...	.....	...	.....
	Total..	110	536,960	100	498,294
Sunderland	Steam.	64	286,390	63	269,018
	Sail...	...	.....	...	.....
	Total..	64	286,390	63	269,018

SIZE OF VESSELS UNDER CONSTRUCTION

The following table shows the vessels under construction in the United Kingdom classified according to gross tonnage:—

TABLE V.

Gross Tonnage.		Number. Steam.	Number. Sail.
*100 and under	500 tons	174	30
500 "	1,000 tons	67	12
1,000 "	2,000 tons	69	..
2,000 "	3,000 tons	61	..
3,000 "	4,000 tons	59	..
4,000 "	5,000 tons	34	..
5,000 "	6,000 tons	124	..
6,000 "	8,000 tons	73	..
8,000 "	10,000 tons	36	..
10,000 "	12,000 tons	6	..
12,000 "	15,000 tons	18	..
15,000 "	20,000 tons	14	..
20,000 "	25,000 tons	4	..
Total		739	42

*Vessels of less than 100 tons are not included in Lloyd's Register shipbuilding returns.

MERCHANT VESSELS UNDER CONSTRUCTION ABROAD

TABLE VI.

Countries.	Steamers and Motor Vessels. Steel. No.	Steel. Gross tons	Wood. No.	Wood. Gross tons	Sailing Vessels. Steel. No.	Steel. Gross tons	Wood. No.	Wood. Gross tons	Total. No.	Total. Gross tons
United States—										
Atlantic Coast..	283	1,738,858	37	68,200	2	4,222	9	10,670		
Gulf Ports	39	183,670	25	54,090	2	9,000	26	66,250		
Pacific Coast ..	141	843,704	38	88,800	..	.....	39	94,250		
Great Lakes ...	126	309,034	..	.....	..	.....	..	.....	767	3,470,748
British Dominions—										
Canada—										
Great Lakes..	23	53,833	..	.....	..	.....	..	.....		
Coast	29	108,020	49	48,950	..	.....	26	10,745		
Other Dominions	24	76,796	9	6,443	..	.....	14	3,678	174	308,465
Belgium	4	7,063	..	.....	..	.....	..	.....	4	7,063
China	12	39,050	..	.....	2	420	..	.....	14	39,470
Denmark	41	66,644	4	1,430	..	.....	..	.....	45	68,074
France	48	169,452	14	4,804	..	.....	2	480	64	174,736
*Germany	..	.....	..	.....	..	....	..	.....	..	.....
Greece	1	900	1	600	..	.....	..	.....	2	1,500
Holland	112	287,718	..	.....	1	324	..	.....	113	288,042
Italy (including Trieste)	52	259,818	32	19,205	7	1,510	17	5,395	108	285,928
Japan	64	299,600	..	.....	..	.....	..	.....	64	299,600
Norway	52	78,831	21	5,110	..	.....	..	.....	73	83,941
†Portugal	..	.....	..	.....	..	.....	29	12,320	29	12,320
Spain	25	90,485	1	220	..	.....	..	.....	26	90,705
Sweden	44	94,477	15	5,870	..	.....	5	870	64	101,217
Total	1,120	‡4,707,953	246	303,722	14	§15,476	167	204,658	1,547	5,231,809

*The figures for this country are not yet available.
†These figures refer to the work in hand at the end of June, 1919.
‡Including 18 ferro-concrete vessels of 54,718 tons.
§Including 5 ferro-concrete vessels of 810 tons.

The tonnage being built in the world at the end of September under the inspection of the Surveyors of Lloyds' Register, excluding vessels the construction of which has not actually been commenced and excluding all vessels of less than 100 tons, amounts to 4,834,805 tons.

U.S. NAVY SELLS VESSELS

The Navy is now advertising a number of vessels for sale, which consist of steam yachts, motor boats, destroyers, gunboats, torpedo boats, barges, scows, sub-chasers, fish boats and tugs. A great many more are to be advertised in the near future.

The Navy is not ordinarily looked upon as a commercial concern, but since the armistice, the Paymaster General of the Navy has been operating a huge mail order business for vessels. This method of sale is not accompanied by all of the pleasures of an old-fashioned charter-party, but the success of the mail order business is shown by the satisfactory disposal of almost a hundred vessels of various types, including 36 motor boats, 14 yachts, 12 barges, 8 fish boats, 3 torpedo boats and tugs, schooners, transports, colliers and steamers.

The terms of sale are lenient, and make it easy for any one who is desirous of obtaining a vessel. On vessels taken over during the war, which are sold under condition B, a ten per cent. deposit is required with the bid. This can be made in either certified check, cash, liberty bonds or guaranty bond, and balance payable at a later date. If liberty bonds are deposited, they are regarded as surety only and are not acceptable in part payment of the vessel.

Boats purchased from the Navy have been used for many purposes. A large number have been restored to the original conditions for pleasure purposes, probably more yet, however, have been converted for commercial work. Some of the gunboats and small cruisers which have been sold are being converted as ocean and lake carriers, the purchaser thus securing an excellent vessel at a very reasonable price. Instances are known where the profits on the charter rate of the vessel have exceeded, in a few months, the purchase price from the Navy. In some instances the boilers and engines have been removed and placed in ferry boats, tugs and other vessels. Many of the vessels have gone to the fishing industry.

During the war the Navy built over 455 sub-chasers. These are seaworthy wooden boats, 110 feet long, fitted with 3 standard gasoline engines of 220 H.P. each. These boats are appraised at very low values in comparison with their original cost of from $75,000 to $80,000 each. Numerous inquiries and bids have been received for these boats. Plans have been discussed for converting them into fire-boats, which can be accomplished for probably a fifth the cost of a new fire tug. Apparently, the best commercial use to which these vessels can be put is in the fishing industry. Careful inquiry has been made at Boston and Gloucester on the conversion work required. The suggestions have been for purchasers to remove two of the engines, using the space occupied by the engines, the officers' quarters and the forward magazine, for a midship hold, which will be approximately 30 feet long. This conversion can be made at a reasonable figure, and the purchaser will then have two spare engines either for sale, use in other boats, or to be kept as spares.

The following vessels are now being advertised for sale, bids receivable on various dates:

MOTOR BOATS—Nightingale, Patrol No. 6, Sea Otter, Bay Ocean, Tillamook, Daiquiri, Euphemia, Jeanette, Sea Gull, Rainier, Susanne, Estella, Ionita, Valeda, Me Too, Magnet, Althea, Hetman, Russ, Maggie, Coyote, Akbar, Kemah, Shur, Ono.

YACHTS — Gloucester, Genevieve, Parthenia, Cigarette, Halcyon II, Admiral II, Dorothea, Margaret, Naushon, Kwasind, Sister, Pawnee, Aileen, Eagle, Kemah, Adelante, Actus, Vega, Hawk.

DESTROYERS — Bainbridge, Paul Jones, Lawrence, Preston, Decatur, Hopkins, Stewart, Truxton, Whipple, Worden, Flusser, Lamson, Preble, Perry, Barry, Dale, Hull, Reid.

GUNBOATS—Isla de Luzon, Princeton, Yantic, Gopher, Essex.

There are also tugs, scows, freight lighters, monitors, torpedo boats, barges, fish boats, mine sweepers, freight boats and sub-chasers being advertised.

Many boats in addition to the above, are to be sold. In order to obtain an opportunity to bid on these vessels, it is requested that all interested write to the Bureau of Supplies and Accounts, Navy Department, Washington, and they will be placed upon the mailing list to receive detailed description of each vessel to be sold, together with the time when bids will be opened thereon. Every effort is made to expedite the awards and the return of deposits. Unsuccessful bidders are notified and their deposits returned, usually within seven days, often sooner. The bids are opened publicly, and upon request of a bidder who cannot attend the opening of bids, an endeavour is made to inform him of the bids received.

JOSEPHUS DANIELS,
11-5-19. Secretary of the Navy.

RAPID HULL-CLEANING AFLOAT

The scarcity of shipping and the transport arrears which have to be caught up in every part of the world, make it imperative to reduce to a minimum the time during which vessels are out of commission. Hitherto, the cleaning of a ship's hull has necessitated dry-docking, with all its attendant delay and expense. In the Port of London, the cost of dry-docking a 7,000-ton steamer is £185 for one day, apart from the cost of cleaning, which is generally done by hand. The perfection of the submersible electric motor in Great Britain has, however, led to the successful development of a means of cleaning hulls while afloat. The machine used consists of a revolving cylindrical brush, driven by a submersible electric motor, which also operates a screw propeller, the function of which is to force the brush firmly against the hull. Power is supplied to the motor from an electric generating set on a barge, which also carries a crane for lowering the machine to its work. It is calculated that the hull of a 7,000-ton steamer could thus be cleaned in about eight hours, with the services of four men only to operate the plant and the barge. The process can go on while the vessel is discharging, coaling, or loading; and, as the barge carries powerful electric lights, the work can be done, if necessary, at night. Apart from the saving in the expense and time of cleaning, this British invention will lead to increased speed and lower coal consumption, as there will be no need to put off the process of cleaning until an opportunity for dry-docking occurs. Demonstrations of the process in various British harbors were proved to be successful by subsequent examination of the hulls in dry-dock.

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

THERE is a further application of specific heat than that we have referred to in the previous article. When dealing with gases there are two specific heats, one applicable to a gas at constant pressure, and one to a gas at constant volume. These bear a definite relation to each other, and their properties must be understood before the practical study of heat as applied to the steam engine can be examined.

The expansion of gases is governed by two laws, that of Boyle, and that of Charles. Boyle's law states that, "At constant temperature the volume of a gas varies inversely as its pressure."

The law of Charles states that, "Equal increments of temperature give equal increments of volume when pressure remains constant."

These laws are applied to perfect gases, and before proceeding further we will define what is understood by a perfect gas. When work is done on a gas, such as in compressing it, energy is expended. All this energy would appear in the gas as heat if it were a perfect gas. Air is spoken of as a perfect gas, but is not quite so, for at certain pressures a portion of the heat depended on it does not appear. It is expended on overcoming the friction of the molecules of the air itself, and is absorbed in them. It may be said that no perfect gas has ever been obtained. A perfect gas is sometimes spoken of as a gas that follows Boyle's and Charles' law.

If a gas is placed in a cylinder, covered with a weightless piston, and heat applied to it, it will expand. In order to do this, the gas must expend some of the energy divided from the heat applied. Another portion of the heat goes to raise the temperature.

Now, if the same amount of gas is confined in the cylinder and heat supplied to it, but expansion prevented, less heat will be required to raise it to the same temperature as in the first case. This is because the gas is confined, and the molecules cannot lengthen their path when heat is applied to them. The heat that is expended in the first instance in increasing the path of vibration of the molecules of the gas is now conserved. The difference in the two amounts of heat can be defined as the specific heat. If the heat required to raise the temperature of the unexpanding gas is 1, then the heat required to raise the expanding gas will be 1.405. This figure is the one for air, but is very nearly that for several other gases.

To get a proper understanding of the relation of specific heats, and their uses in thermo-dynamical problems, we will follow out the equations of the two laws already mentioned.

Take Boyle's law first: "At constant temperature the volume of a gas varies inversely at its pressure." That is to say, that if we have a volume of gas, say, 2, and a pressure equal to 4, the product of pressure and volume, as long as temperature remains constant, will always be 8, no matter how the pressure and volume may vary. For, if we increase the volume to 4, we decrease the pressure to 2, and if we increase the pressure to 8, the volume decreases to 1. This is expressed mathematically by the term $p\,v = p_1\,v_1 =$ constant. Substituting the figures as above, $4 \times 2 = 2 \times 4 = 8$. The product remains the same.

The law of Charles deals with a gas at constant pressure, the volume and temperature being the varying properties, or a gas at constant volume, the pressure and temperature varying. The amount of variation depends on the absolute temperature.

If a gas at constant pressure, p, is heated so that its volume is increased from v to v_1, the temperature will have increased from T to T_1. The capital T represents, in all cases, absolute temperature. The expression for this condition will be

$$\frac{v_1}{v} = \frac{T_1}{T} \quad \text{or} \quad v_1\,T = v\,T_1$$

If this gas is kept at constant volume, and temperature added so that the pressure is increased, then the equation is

$$\frac{p_1}{p} = \frac{T_1}{T} \quad \text{or} \quad p_1\,T = p\,T_1$$

The equation, or we might say the characteristics, of a perfect gas, as expressed in an equation, is obtained by combining the equations of Boyle's and Charles' laws. We have seen that gas at a pressure p and volume v, at constant temperature, changed to pressure p_1 and volume v_1, changes its volume in direct proportion to the change in pressure, and we expressed it as

$$p\,v = p_1\,v_1$$

$$\therefore \quad p_1 = \frac{p\,v}{v_1}$$

Now, by Charles' law, equal increments of temperature produce equal increments of pressure at constant volume. So, if we have a volume of gas at pressure p_1 which is increased in temperature from T to T_1 and remains at constant volume, increasing in pressure from p_1 to p^1, we have

$$p_1 : p^1 :: T : T_1$$

$$\text{or} \quad p_1 = \frac{p^1\,T}{T_1}$$

The combination of these equations $p_1 = \frac{p\,v}{v_1}$ and $p_1 = \frac{p^1\,T}{T_1}$ gives $\frac{p^1\,T}{T_1} = \frac{p\,v}{v_1}$ and expressing them both in terms of p v by transferring we get

$$\frac{p\,v}{T} = \frac{p^1\,v^1}{T_1}$$

This may probably be made somewhat more clear by taking a numerical example. If we have one pound of a gas, say air, at a pressure of 15 lbs. per sq. in. absolute, and a volume of 12 C. F. and absolute temperature of 520 degrees F., this will correspond very closely to air at normal pressure and temperature. Supposing the volume is increased to 18, the temperature remaining constant. Then, by Boyle's law,

$$p\,v = p_1\,v_1$$

$$15 \times 12 = p_1 \times 18$$

$$\frac{15 \times 12}{18} = p_1$$

$$\text{and} \quad p_1 = 10$$

If the volume remains constant at v_1 and the pressure and temperature are increased from p_1 to p^1 and T to T_1 we get

$$\frac{p_1}{p^1} = \frac{T}{T_1} \quad \text{or} \quad \frac{10}{p^1} = \frac{520}{T_1}$$

Assume that the pressure is increased to 15 lbs., then

$$\frac{10}{15} = \frac{520}{T_1}$$

$$\text{then} \quad T_1\,10 = 520 \times 15$$

$$T_1 = \frac{520 \times 15}{10}$$

$$T_1 = 780$$

$$\text{Now} \quad p_1 = \frac{p\,v}{v_1} \quad \text{and} \quad p_1 = \frac{p^1\,T}{T_1}$$

$$10 = \frac{15 \times 12}{18} \quad \text{and} \quad 10 = \frac{15 \times 520}{780}$$

$$\text{so} \quad \frac{p\,v}{T} = \frac{p^1\,v^1}{T^1}$$

Substituting figures

$$\frac{15 \times 12}{520} = \frac{15 \times 18}{780}$$

which, reduced to its lowest fraction, is

$$\frac{9}{26} = \frac{9}{26}$$

or, transposing

$$15 \times 12 \times 780 = 15 \times 18 \times 520$$
$$180 \times 780 = 7800 \times 18$$
$$18 \times 78 = 78 \times 18$$

Now, if T remains constant, p and v alter in inverse proportion to each other. If p and T alter, v remains constant, and if v and T alter, p remains a constant, so the expression

$$\frac{p\,v}{T} = \frac{p^1 v^1}{T^1}$$

is a constant. So we may denote it by a symbol R and the expression is put

$$\frac{p\,v}{T} = R$$

so that $p\,v = R\,T$ and $p^1 v^1 = R\,T^1$

This is called the equation of the gas. The value of R can be found for any gas, if we know the volume of 1 pound. For instance, air at 14.7 lbs. absolute pressure has a volume of 12.39 C.F. Then $p\,v = R\,T$, and if the temperature is 32° F. or 492 absolute, we have

$$p\,v = R\,T$$
$$14.7 \times 12.39 = R \times 492$$
$$R = \frac{14.7 \times 12.39 \times 144}{492}$$
$$R = 53.43$$

We have been dealing with only one pound of the gas. If we have any larger quantity, say w pounds, then the formula will be $p\,v = w\,R\,T$, or for air

$$p\,v = w \times 53.43 \times T$$

As an example, if we have a cylinder of compressed air containing 10 lbs. air at a temperature of 100 degrees, and a gauge pressure of 100 lbs. per sq. in., what is the volume?

$$p\,v = w\,R\,T$$
$$144 \times 114.7 \times v = 10 \times 53.43 \times 560$$
$$v = \frac{10 \times 53.43 \times 560}{114.7 \times 144}$$
$$v = 18 \text{ C.F.}$$

Do not forget that pressures and temperatures are absolute, and, therefore, 14.7 must be added to gauge pressures and 460 to thermometer temperatures. Also, the pressure per square inch must be multiplied by 144 to bring it to square feet, as we are dealing with volume per cubic foot.

In speaking of a perfect gas, we said that all the heat put in would show as energy. No gas being perfect, some heat is lost in overcoming internal resistance in the gas itself. We, therefore, can express the action of the heat as applied to a perfect gas by a formula.

If H = total heat
S = heat used in increasing temp.
I = internal work
W = external work

Then $H = S + I + W$.

If the gas were perfect, then I would not appear and $H = S + W$.

From this we see that the heat applied to a perfect gas, which expands against a resistance, will be partially absorbed in doing external work. This heat will no longer be in the gas. The heat remaining will be the difference between the total heat applied and that used for external work, or

if $H = S + W$, then $S = H - W$.

Any alteration in the internal energy of a gas is that induced by a change of temperature, for, if a gas is changed in volume or pressure without the addition or substraction of temperature, the internal energy remains the same.

The specific heat of a gas at constant volume is denoted by the symbol C v, and at constant pressure by C p. If expressed in foot pounds instead of heat units, the symbols are K p and K v. The specific heat of air at constant pressure is .2375, and at constant volume .1689. Now, multiplying these figures in each case by 778, the equivalent of 1 B.T.U. in foot pounds, we get 184.77 and 131.4. Therefore, C p = .2375 ; C v = .1689 ; K p = 184.77 ; K v = 131.4.

NEW BRITISH DESTROYER

On Friday, October 10th, Messrs. J. Samuel White & Co., East Cowes, Isle of Wight, delivered to the Navy a new and powerful destroyer of the "W" class. She was built in the oldest shipyard on the Admiralty List, and is named the "Witherington." This name has not hitherto been applied to any war vessel, and memorializes a celebrated hero of the Battle of Chevy Chase in 1388, whose exploits are versified in the following lines:

"Witherington needs must I wayle
As one in doleful dumps;
For when his legs were smitten off
He fought upon his stumps."
—Ballad of Chevy Chase.

H.M.S. "Witherington" was laid down on July 29, 1918, and launched on January 16th, 1919. She is of 1,450 tons displacement and 28,000 S.H.P. During extensive and satisfactory trials at Skelmorlie, in the early part of September, she attained a speed of 35 knots. The "Witherington" has been constructed, engined and fully equipped by Messrs. White's, her propelling machinery consisting of two Brown-Curtis geared turbines, whilst her oil-fired boilers are the well-known White-Forster water-tube boilers, which are installed in the fastest vessel in the world, the U.S.A destroyer "Cole" (speed 41.1 knots).

The "Witherington's" armament consists of superimposed guns fore and aft, anti-aircraft high angle guns, and triple sets of torpedo tubes amidships. This new and up-to-date warship, embodying every improvement of modern requirements, is the 71st torpedo vessel completed by the firm, several of which have earned undying fame during the past war.



H.M.S. "WITHERINGTON."

COAL GAS FOR MOTOR CARS

Very important results have been reached by the Committee appointed by the British Government to examine the feasibility of using ordinary town gas for the propulsion of motor cars. The Committee has come to the conclusion that town gas can be effectively, safely, and promptly substituted for motor spirit, as a fuel, on ordinary motor vehicles. Commercially, 250 cubic feet of town gas, of average quality, are equivalent to one gallon of motor spirit: that is to say, gas at 4s. per 1,000 cubic feet, is equal, as a fuel, to motor spirit at 1s. per gallon. Details are given of the proper construction and use of gas bags, but a strong recommendation is made that experiments should be made on a commercial scale with gas compressed in rigid cylinders up to at least 1,800 lb. per square inch. Such experiments are now being carried out on London omnibuses and are, we understand, giving most promising results. Tests are also being made by British engineers, at the suggestion of the Committee, of gas-generating plants carried on the vehicles themselves.

Ocean Service Improving.—According to Mr. A. G. Henderson of Glasgow, director of the Cunard and Anchor Steamship Lines, a great improvement would soon be noted in ocean services. Both the lines he was interested in were building new steamers rapidly, and these vessels were more commodious than their predecessors. In about one year to a year and a half the services between Canada and Great Britain and Europe would be equal, and may be superior to those of the pre-war period.

Molding a Marine Engine Thrust Bearing Block

This Casting Stands Between the Engine and the Propeller to Take the Thrust of the Propeller and Save the Engine. It is Quite a Complicated Piece to Mold

By JOHN H. EASTHAM

THE thrust bearing block casting shown in detail at figures 1, 2, 3, weighing approximately 3,700 lbs. (three thousand seven hundred) pounds, and intended for use in a canal-sized freighter, fitted with triple expansion engines of thirteen hundred horsepower, is of ordinary design, strength and rigidity, combined with lightness, and high grade output are of primary importance, any advantage gained in the pattern shop and core room being offset by the element of risk and additional molding expense incurred.

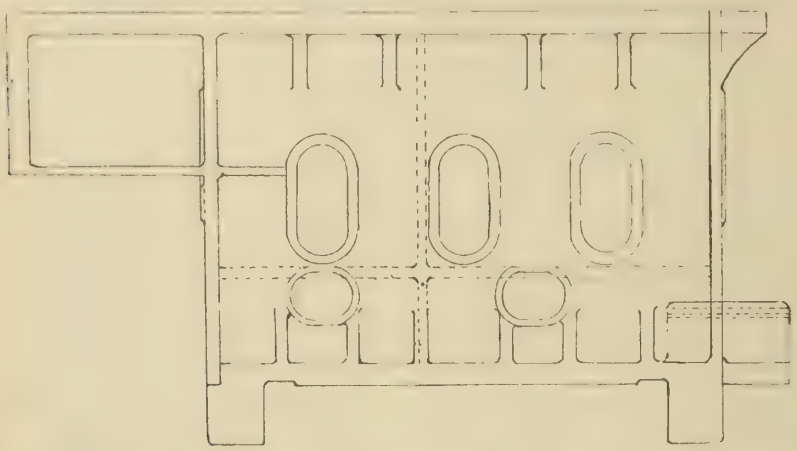


FIG. 1—SHOWING LINE SKETCH OF MARINE ENGINE THRUST BEARING BLOCK.

being the factors contributing to a choice of several methods of production in the foundry.

Its boxed-out design, together with the transverse internal strengthening web plate and ribs, the babbitt arrangement in the shaft bearing, the hand-holes, outside flanges and brackets, necessitate the use of a good many dry sand cores, much of the molder's energy being in the direction of their correct assembly before closing the mold prior to casting. Roughly, three general methods of molding the piece are permissible, namely, the skin-dried mold with lower flanges and brackets drawn inwards or bared by the removal of a full depth draw-back plate at each side, the all-dry sand method, using block cores to cover the full area of the pattern along each side, thus forming the upper and lower flanges and brackets, the hand-hole cores being pasted into special prints rammed up in the block cores for the purpose, or the green sand mold, with lower flange and brackets formed in core to ensure safety when pouring, this latter method being denominated "A," whilst the second mentioned or block core method is marked "B," in the cross section view of the finished mold at Figure 4.

The first named, or draw-back method, while reducing the cost of coremaking to perhaps the minimum, has nothing further to recommend its adoption in foundries where low cost of production

In method "A," shown to the left in Fig. 4, the pattern is built up as for ordinary green sand practice. The upper flanges and brackets being screwed or nailed to the main pattern, and the hand-hole prints held in place by dowel pins or screws, these being removed in the usual way when the outside is rammed sufficiently high so as to allow the print and strengthening bead to be drawn inwards in one piece after the removal of the body pattern, no prints of any kind being necessary to mark the position of the lower flange cores, as the procedure hereafter described will show.

A pit some 12 inches deeper than the overall height of the pattern is first prepared, sufficient clearance at each end and side being allowed to permit perfect freedom of action while lowering the flange cores to place and ramming round the pattern, a coke bed being next spread over a slightly larger area than that occupied by the casting, and a vent pipe sloped, as shown from the coke to a point above the floor level and clear of the area to be covered by the cope flask.

Paper or straw having been spread over the entire surface of the coke bed in the usual way, floor sand is now rammed up over the whole to a depth of about ten inches, a hard facing sand bed being next levelled at full pattern depth from the pit edge, struck off and vented down to the coke all over its area, two round or square plugs being also rammed up on the coke in the centre of each half of the lower main core print's location, the orifice left on their withdrawal allowing the gases generated in that portion of the casting below the transverse web in the lower main core to escape. The pattern is now lowered to place and roughly bedded in, care being taken to preserve the bed along each side, following which the side cores "A" are placed into position, the mold being next rammed up to the joint and the parting made, reinforcing rods being placed in the bracket corners and at intervals round the hand-hole prints, or wherever necessary.

The cope flask is next rammed up, with runner, risers, and upper body core vent plugs in correct positions, hoisted off and the pattern drawn out after the necessary preliminaries in the way of swabbing and loosening, the lower main core print, shaft bearing extension piece with its core print, and hand-hole prints all remaining to be drawn afterwards, in accordance with good molding practice. The lower main print serving as a working platform, and being removed last immediately before placing the cores in the mold.

As shown at Fig. 4, the method of gating differs considerably from the usual practice of bottom pouring, a pair of one-inch round plugs being rammed up in the upper main core, and the metal "plumped" down through these two one-inch round holes onto the lower main core, the casting being thus gated near the centre, on the transverse web, a reasonable fillet being provided at the junction of each gate with the casting, the danger of "breaking in" being thus avoided.

Excepting those placed on the lower

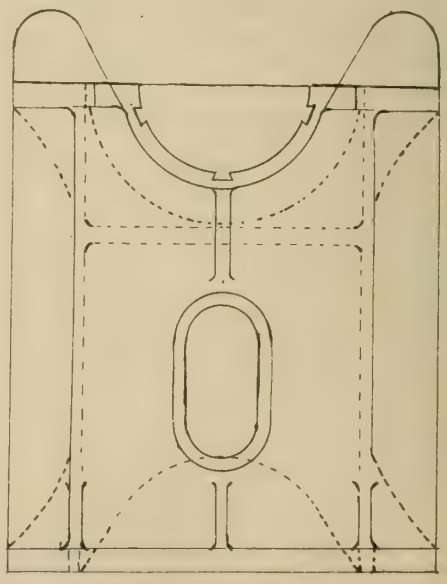


FIG. 2—SHOWING ANOTHER VIEW.

main core to support the upper one, thus leaving the one-inch space occupied by the cross web, comparatively few studs or chaplets are needed, outside of those required to keep the shaft bearing core in place, the babbitt space cores being pasted into it by the coremakers before handing over the cores to the molder, whilst the hand-hole cores along the sides and at each end act as buffers, and resist any tendency to move on the part of the upper main core.

Method "B" differs from "A" to the extent that both upper and lower flanges and brackets are made in core, as shown at the right of Figure 4; core prints of full pattern depth and length added to the pattern in this instance, a plain outside "ram up," and less mold finishing being thus encountered, the onus being thrown on the core room, two or three hours' molding time being saved, and five or six hours' core-making added to the job, with the extra difficulty of placing the pair of deep narrow cores to their precise position. Analyzing the three methods above briefly outlined, that marked "A" is ahead of the other two from the aspect of cost, and also as regards quality of finished product, the cost of core-making being brought as low as is consistent with safety, scales or cuts while pouring being specially noticeable by their absence.

The core-making does not need any special description, having no peculiarities, cast iron grids being used in the main cores as shown, loose hooks or an extra heavy pair of prods in each grating seeming to hoist the cores around by, and a liberal allowance of cinders

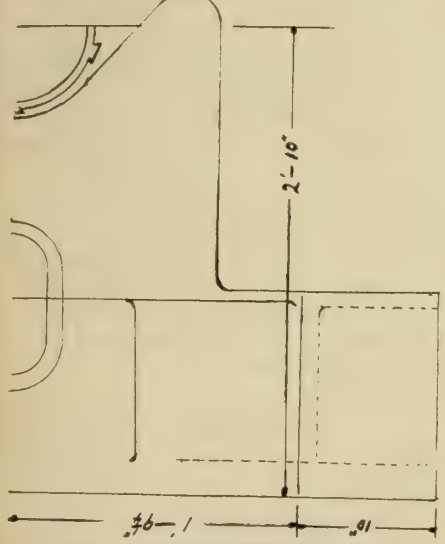


FIG. 3—ANOTHER VIEW OF SAME.

being rammed up in each main core to facilitate drying and venting, particular care being taken in the case of the lower main core that the vent from the coke communicates directly with the holes above referred to, leading down to the cinder bed, for if you have any obstruction in this instance, look out for a pyrotechnic display, with the usual lamentations to follow.

The core boxes for the main or inside

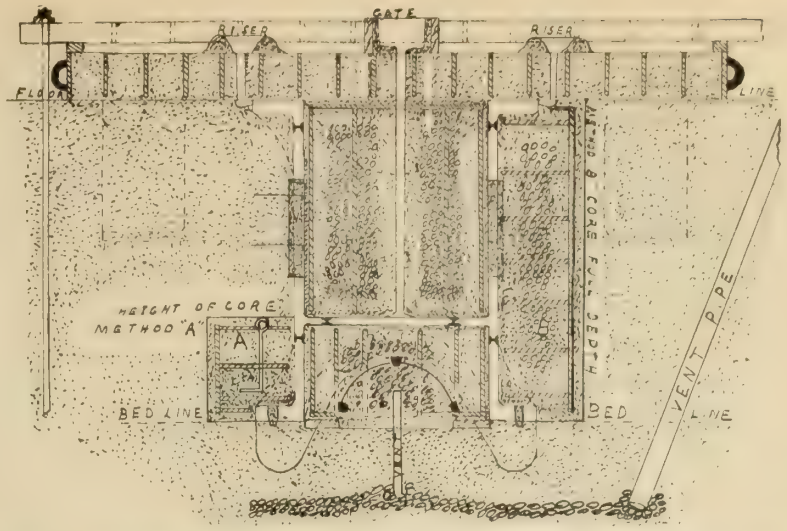


FIG. 4—SHOWING SECTION OF ASSEMBLED MOULD FOR MARINE THRUST BEARING BLOCK.

spaces are best and cheapest made of skeleton type, open top and bottom, screwed up in four pieces, the fillets being easily cut away and rounded when finishing the cores, no trouble being experienced by this method if good, strong, straight core plates are used, or if you ram them up on the flat face of the oven car, but if you try to carry these and similar cores, weighing perhaps fifteen hundred pounds each, about the shop in a green condition, on plates three-eighths or half an inch thick, you are going to make the long-suffering coremaker wonder what he did in his youth to deserve being sentenced to such a trade.

Needless to say, a high-grade metal is essential, both on account of the strength required, and amount of machinery on the job, the following analysis being eminently suitable:

Silicon Per cent.	Sulphur Per cent.	Phosphorus Per cent.	Manganese Per cent.
1.50 to 1.75	Under 0.10	0.30 to 0.60	0.60 to 1.00

A cursory examination of the foregoing analysis will show that the use of charcoal iron or a considerable steel scrap content, preferably the latter, in the charges, is necessary to obtain the results and staying power needed, as is also a high pouring temperature, with rapid filling of the mold, the latter to avoid the risk of cold sheets, however faint or apparently harmless they may appear, the chance of a broken thrust block in a heavy sea, with the propellers out of the water, and "cutting wind" half the time at high speed, with the consequent sudden check and strain at every immersion, being by no means imaginary.

THE MISSING ONE

We recognize many
Of the old bar fixtures
All camouflaged up
As soda fountains,
But the old bar-flies
Seem to have passed on.

Arkansas "Gazette."

AN INTERESTING TOWING FEAT

When the steamship Alcona was preparing to leave Balboa for Antofagasta recently, her chief engineer, Mr. Esmeraldo, was asked by an official of the United States Shipping Board whether he could tow to that port a French bark loaded with 3,000 tons of coal.

This was a serious proposal, for several reasons. In the first place, the Alcona was already deeply loaded. Secondly, the only hawser available was but 200 fathoms long, which would bring the bark within the back water of the steamer and thus make towing difficult. Thirdly, the screw of the Alcona was not proportioned for towing work, and, finally, the chief had no information as to how the ship's geared turbines would stand up under such a test. However, he had the greatest confidence in the Alcona, her equipment and her crew and undertook the job.

The tow started, and fourteen and a half days later the Alcona and her charge finished the 2,000 nautical mile voyage without the slightest hitch. The machinery performed splendidly, without groaning or laboring, and with no undue heating at any point. The average speed was 6.3 knots and only a slight increase in the daily fuel consumption was noted.

The Alcona is a steel cargo steamer 335 feet long, 46 feet beam, and 28 feet 6 inches depth, of 3,658 gross tons, built last year for the Shipping Board by the Submarine Boat Corporation, Newark, N.J. The vessel's propelling machinery consists of two oil-fired watertube boilers and a set of Westinghouse geared turbines driving a single screw.—"International Marine Engineering."

G. D. Robinson, who was for twenty-five years with the Canadian Pacific Ocean Service, and European freight agent when he severed his connection recently, has now opened offices in the Coristine Building, Montreal, Room 511, where he will carry on a business of steamship freight broker, shipping, forwarding and chartering agent.

Eastern and Western Canada Marine Activities

November Correspondence

BRITISH COLUMBIA

WHILE the primary purpose of Sir Henry Drayton's visit to the Pacific Coast recently was to put an added impetus behind the Victory Loan drive, Canada's Finance Minister made the most of the opportunity afforded him of getting at the truth of British Columbia's shipbuilding situation.

Both in Victoria and Vancouver Sir Henry conferred with representatives of the industry, as well as the business interests generally, with a view to ascertaining just what those most competent to judge believed should be done by the Dominion Government in the way of building up a fleet of merchant vessels, especially adapted to the lumber-carrying trade, and incidentally relieve the unemployment that threatens to become serious this winter in the coast cities.

Sir Henry, although he made no definite promises and made it clear that he personally believed the Dominion Government, under normal conditions, was not justified in embarking upon commercial shipbuilding, nevertheless gave the impression that he would make a recommendation to the Cabinet on his return to Ottawa to the effect that the shipbuilding programmes in Victoria and Vancouver be extended. The Wallace Shipyard in North Vancouver, it is announced, has already been awarded contracts for the construction of two more steel cargo-carriers of the 8,800-ton type, and the Coughlan Company also expects new orders for Federal account.

It also seems probable that the Harbor Marine Company at Victoria, now engaged in the construction of two steel steamships, will receive contracts for two more, thus providing work sufficient to keep the plant in operation until well on into next year. The present contracts should be completed about February, 1920.

The principal development expected by Victoria as a result of the conference with Sir Henry Drayton is an extension of the wooden shipbuilding industry. Both the Foundation Company and the Cholberg Shipyards, after turning out considerable tonnage for British, French and Norwegian interests, are now idle. It has been proposed that the Dominion Government advance money for the building of wooden schooners for the lumber trade, and indications point to the award of contracts of this character to both plants within the near future. The Government has been asked to loan up to 80 per cent. on the cost at 6 per cent. interest. It was urged that the earnings of the shipbuilding and operating concern, which would be backed by lumber capital, should be exempt from the income tax until such time as the indebtedness is paid back to the Government. It was pointed out that freight rates would commence to drop shortly and that the company would have to pay for itself within the next twelve years. Sir Henry appreciated this argument and said that the Government realized the fleet must be so financed as to be able to compete with others in the same trade when the freight rates dropped.

The Vancouver Island Riggers' and Sailmakers' Association, a co-operative organization recently formed within the Victoria union of riggers and sailmakers, is seriously considering the construction of wooden schooners on its own initiative. Capital would be subscribed by members of the association, as well as outside business men. The proposal is to have each man draw only part of his wages, leaving the remainder in the company, receiving stock in exchange. This is expected to supply $30,000 of the necessary capital. The association also intends to ask for Government support.

Not enough business is offering to make a steamship service between Atlantic and Pacific ports of Canada a paying proposition, according to advices received from Ottawa by Mr. H. H. Stevens, Federal member for Vancouver. Many months ago the Dominion Government made plans for an early inauguration of this service, which was interrupted by war conditions, but evidently there is considerable time yet to elapse before it becomes a reality.

Announcement from Ottawa that the Dominion Government intends to enter competition with the Canadian Pacific on the triangular routes between Victoria, Vancouver and Seattle has caused considerable surprise in coast shipping circles, and future developments will be eagerly watched. According to Hon. C. C. Ballantyne, Minister of Marine, tenders will be called before January 1 for the construction of two very fast vessels for the triangular run. These vessels, which will be operated in conjunction with the Canadian National Railway System, will, according to present plans, be fifty feet longer than the C.P.R. boats now in the service and will be several knots faster. This means that the proposed vessels will be about the finest ferry boats in operation anywhere in Canada. Mr. Ballantyne is evidently not going to stop with the inauguration of a ferry service, however. He has ambitious plans for the development of trans-Pacific trade as well, and while a recent interview discloses that the service to Australia, Japan, China and possibly to India, now contemplated by the Minister, is only for freight, Mr. Ballantyne hopes to put passenger liners on the ocean run in the early future, plying out of Victoria and Vancouver and touching in the Far East virtually the same territory as that now served by the Canadian Pacific Ocean Services.

Shipping interests are also watching closely the negotiations now on foot for the erection of a big wireless station on the southern end of Vancouver Island, capable of communicating with the Bolinas, California, station, which has trans-Pacific radius. Committees of the Vancouver and Victoria Board of Trade have been active in the matter and have recommended the Dominion Government to proceed with the work on the ground that, under present conditions, the American wireless facilities on the Pacific seaboard are far superior to the Canadian and that such a state of affairs is seriously detrimental to Canadian interests. It is understood that the Department of Naval Service has before it an application for license to install a 50-kilowatt high-power wireless station near Victoria, having a minimum radius of 1,000 nautical miles, and a wave length of 6,000 metres. The Canadian Marconi Company is making the application. Coast business interests are urging the Government to either grant this license or else follow out its policy of national ownership of wireless services, and install a similar plant with Government funds.

The Lady Mine, one of the best known schooners that ever sailed the North Pacific, and which has been lying in Victoria harbor ever since the Pelagic Sealing Treaty came into force in 1911, has been sold to Captain W. H. Smith, of Nova Scotia, for use in the local coastwise trade. The boat may be used later in trading to the islands of the South Pacific. The Lady Mine was built in San Francisco as a pilot boat. She was bought by Mr. A. J. Bechtel and the late Richard Hall, both of Victoria, and equipped for the sealing trade, in which she engaged until the industry was closed by the treaty. Her new owner, Captain Smith, lost his ship, the Milwaukee, during the war, and for some time was assistant superintendent of the C.P.O.S. at Liverpool.

MONTREAL

Weather conditions are now beginning to impress the officials of the port of Montreal, and shipping men in general, of the necessity of being in readiness for the near approach of the winter and consequent closing of the river service for the winter season. Steps are now being taken for the close of navigation and work of picking up the river bouys has already been started. It was anticipated a few weeks ago that the open season would extend well into December, and even do as well as to eclipse last year. However, the change this week to cold and snow makes the closing date one of marked uncertainty. The

season's activities have been less pronounced than last year, but compares very favorably with pre-war business. Movement of munitions and war supplies were largely responsible for the heavy traffic of 1918, but a noteworthy feature of this year's activities is the big increase in the trade with France and other countries, that, in previous years, were involved very slightly or not at all. Last year's reports show that 517 ships came to the port, and so far the arrivals this season has been over 470. To equal last year would require extra heavy traffic for the balance of the open season. Passenger vessels are still coming to the port, but the sailing of the Scandinavian, on November 26, will probably be the closing date for this service.

Heavy storms, during the early part of the month, along the Atlantic and the lower St. Lawrence, was resultant in considerable damage to shipping. At Portsmouth over 15 shipping vessels were torn from their moorings and driven out to sea or cast ashore. The Liverpool signal station was blown down, and many bouys cast adrift. The Audrey, a large three-masted schooner, was wrecked on the rocks near Liverpool. The large freight steamer Germanicus, westbound to Montreal, early in the month, went on the reefs near Father Point. This ship is of German origin, with a net tonnage capacity of about 2,600 tons, and is at present operated by the British Shipping Controller. She was coming light to Montreal to take on a cargo of grain. The first efforts to save the vessel were unsuccessful, as it was found that she was hard and fast about the middle of her length. The latest reports appear to be more favorable and there is still hopes that the vessel will be salvaged, but the damage will be considerable and may be further increased with additional buffeting. Even if she is got off safely there is little likelihood of her coming to Montreal this season.

Reports indicate that the Greek steamer Platea, which grounded on Sable Island early in the month, will probably become a total wreck. The crew and what little cargo she had aboard, was safely taken off, but the ship itself will likely be abandoned. The vessel was one of over 3,000 gross tons, built by Russell and Company of Glasgow, in 1897. Two other Greek vessels, the Telemachus and the Elenestathatos, were also reported in distress, having engine and hold trouble.

The British steamer Rio Neigero was another of the many vessels unfortunately caught in the stormy weather of the early half of the month. She grounded on the rocks near the lighthouse at Pointe-des-Monts and seriously damaged her bows, but floated again with the rising tide. She was taking considerable water, but succeeded in reaching Quebec safely, where she will go into drydock.

The three-masted sailing vessel, George S. Smith, was caught in a mid-November storm, went ashort near Pointe-des-Monts and in all possibility will be a total wreck, as she is in a very bad condition. The stranded vessels along the river are more numerous than has been seen for many years.

The coal situation, which was expected to be relieved with the official calling off of the strike in the States, is now becoming quite serious, as it is stated that few of the miners are obeying the orders to return to work. In the case of British vessels, bunkering may be carried out at Nova Scotia coast coaling stations, but the question of supplying coal to American vessels may mean trouble in Nova Scotia areas. Shipping interests are watching these developments with considerable interest.

Following a visit of Capt. Walsh and Thos. Robb, of the Shipping Federation, to the port of St. John this month, the longshoremen there will receive a set rate of 70 cents per hour. St. John, being a tidal port, this rate will be a uniform one and will apply throughout the entire year.

A feat worthy of mention in connection with navigation on the St. Lawrence was that of the skipper of the Joazeiro, a Brazilian Government steamer, in taking his boat nearly up to Quebec without an official pilot. The captain has never been in these waters before and was unaware of the necessary regulations, and so ran past the pilot's ground. However, he was still oblidge to pay the pilot's fee, the same as if he had used their services.

The engineering firm of Peacock Bros. will shortly remove their offices from 285 Beaver Hall Hill to 175 Delorimer Ave., where the manufacturing plant is located and operating under the name of the Clyde Engineering Co. Considerable expansion has taken place recently and still further development is anticipated.

One of the features of the Prince's sojourn in Montreal during the past month was the official visit to the harbor and the port of Montreal, and the laying of the coner stone of the Sailors' Memorial, which is being erected on the Victoria pier, a site already historic, as the pier bears the name of the Prince's great-grandmother, Queen Victoria. It was the spot on which King Edward landed when on his visit in 1860. The pier itself was officially opened some few years ago by the Duke of Connaught.

During the month of October the traffic of grain through the Lachine Canal showed a substantial increase over the previous month. The total was well over 4½ million bushels, three-fourths of which was wheat. It is assumed that the New York dock troubles has been partly responsible for the larger grain shipments down the lakes to Montreal. The volume of dairy produce has materially decreased. Apple shipments have been larger, the figures being 7,460 barrels in October this year, compared with 2,672 barrels last year. The total cargo tonnage was greater, the month of October this year showing over 404,000 tons, against 305,000 for the same month last year.

The finding of the Board of Conciliation, after investigating the claims of the wireless operators on the Great Lakes, has been announced, and as a result, substantial wage increases will be granted to all wireless operators on the lakes service. The Marconi Company, however, have decided to apply the revised rates to every operator throughout their entire service, in which about six hundred men are engaged. The new rates of pay will mean increases ranging from 50 to 100 per cent. The Board commended the splendid spirit of the Marconi officials, in not alone appreciating the reasonable demands of the men, but also in their immediate willingness to extend the new wage scale to the greater number of operators on the ocean service, not within the present finding of the Board. A recommendation is under consideration for a revision of the present contract with the Government, as regards the operation of wireless stations on the Great Lakes. The contract figure of $3,500 per year per station is less than half that required to maintain efficient service.

Some idea of the changing conditions that are taking place in world commerce may be gathered from the export of coal that has recently taken place from this country. While this state of affairs is largely due to the recent attitude of British labor, there is, nevertheless, a possibility that trade of this kind may be permanent in character. The steamer Ariant, recently arrived at Halifax with a general cargo, has been diverted from her regular activities and will take on a cargo of coal at Sydney for the United Kingdom. Another instance of coal trading is the shipments of fuel that are now going to Holland. Some time ago the Netherlands Government obtained some 90,000 tons of Canadian coal, and it has been announced that the Dutch Government are so well pleased with the quality of the coal that a further order for upwards of 200,000 tons has been placed.

J. W. Norcross, president of the Canada Steamship Lines, has recently returned from Europe, and is very optimistic regarding the shipping activities, both of this and other countries. He states that British and French shipping interests anticipate a period of several years of continued favorable conditions as exist at the present time. Of his own direct interests Mr. Norcross stated: "Developments that have already occurred in the Atlantic business of the Canada Steamship Lines have more than justified this, and important extensions and improvements are now being contemplated." He looks for considerable emigration from the British Isles to Canada during the coming year, and appreciates the fact that shipbuilding and industry in general will greatly benefit by the additional skilled labor that will be available.

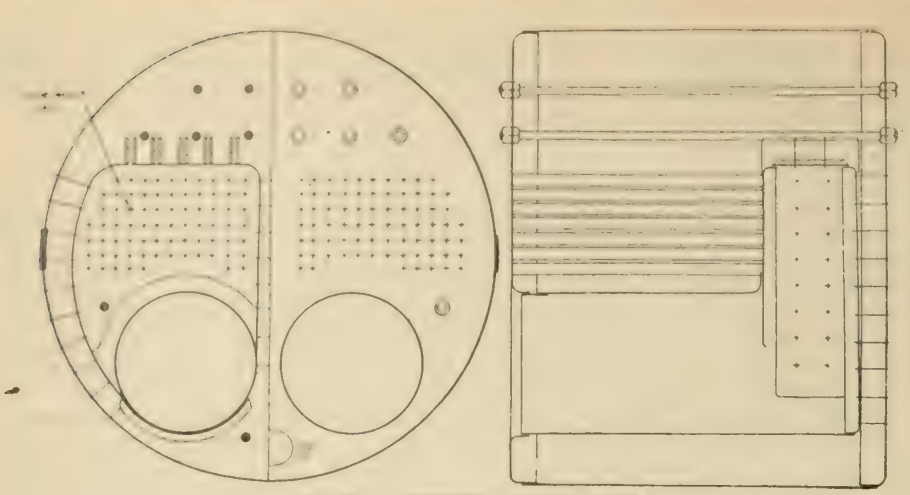


DIAGRAM SHOWING SPLIT TUBE.

BOILER EXPLOSIONS

Explosion from the Boiler of the S.S. "Jucar"

THE Jucar is a steel cargo steamer of 242 tons gross register, engaged in the coasting trade.

The boiler is of the ordinary multitubular marine type, and is made of steel throughout with the exception of the tubes, which are lap-welded iron. It is 11 feet 6 inches in diameter and 9 feet 6 inches in length, and is fitted with two plain furnaces, 3 feet 6 inches in diameter. It is provided with all the usual mountings, including two spring-loaded safety valves adjusted for a working pressure of 125 lbs. per square inch. The furnaces lead into separate combustion chambers, each of which is fitted with 75 return tubes, 3¼ inches external diameter, divided into 55 plain tubes, No. 8 W.G., with the ends expanded into the front and back tube plates, and 20 stay tubes, 5-16 inch thick, screwed into the tube plates.

One of the stay tubes, the position of which is indicated on the attached drawing, split longitudinally for a length of about 2½ inches at the combustion chamber end and began to leak; three stay tubes in the port combustion chamber and the whole of the ordinary tubes in both combustion chambers began to leak; about 60 of the screwed stays in the starboard combustion chamber and 20 in the port chamber also started to leak, and this combination of leakage in a very short time practically emptied the boiler.

The explosion appears to have been caused by overheating of the tube ends and the combustion chamber plates, due to accumulation of scale on their surfaces on the water side.

The engineer-surveyor-in-chief states: The disablement of this boiler, which also resulted in the disablement of the ship, was apparently brought about by the excessive accumulation of scale on the heating surfaces, and the mishap was, therefore, preventable. A different story might have had to be told had the weather been stormy at the time of the breakdown, as the vessel was in the vicinity of an exposed and dangerous coast.

Explosion from the Boiler of the S.S. "Solway Queen." Enquiry Conducted by Mr. F. Carruthers

The Solway Queen is an iron cargo steamer of 307 tons gross register.

The boiler is of the ordinary multitubular marine type, and is made of steel. It is 11 feet 3 inches in diameter, and 9 feet in length, and is fitted with two plain furnaces 3 feet 2 inches in diameter. It is provided with the usual mountings, including two spring-loaded safety valves, adjusted for a working pressure of 150 lbs. per square inch. The manhole from which the explosion occurred is situated in the lower part of the front end plate, between the furnaces and is of elliptical shape, the major axis being 15 inches and the minor 11⅜ inches. The door had been made from a single plate 1—5-16 inches thick, machined down to form a flange for the joint, and leaving a spigot 7-16 inch deep for the manhole, and was fitted with two 1⅜ inch studs, 6¼ inches between the centres, riveted over on the inside of the door. The usual cross bars were used for holding the door in position.

A piece of the joining material of the bottom manhole door, 4 inches in length, was blown out, and through the aperture thus formed, the contents of the boiler were discharged into the stokehold and engine room, the steam pressure at the time being about 150 lbs. per square inch.

The explosion was due principally to the spigot of the manhole door being a bad fit in the manhole ;it was, however, also partly due to the joint not having been properly screwed up. The minor axis of the manhole is 11⅜ inches, that of the spigot on the door was 10—15-16 inches. The jointing material was new, and being softened by the heat and lacking the support of the spigot was ruptured by the pressure in the boiler.

The observations of the Engineer Surveyor-in-Chief are as follows: The manhole door of the boiler was a bad fit, and it was consequently somewhat difficult to place it in its central position when making the joint. In this instance this difficulty seems to have been experienced, and part of the joint was blown out under pressure. Fortunately, the results were not serious.

On November 8, Canadian Vickers, Limited, launched from their yard at Montreal, the seventh vessel that they have completed for the new merchant marine of the Canadian Government. The ceremony was performed by Mrs. Alex. Johnston, the wife of the Deputy Minister of Marine and Fisheries. The latest addition to the Canadian Merchant Marine will have the name of the "Canadian Spinner," and the vessel will be, in all respects, similar to all the others that have been launched from this yard, her dimensions being: 400 feet in length, 52 feet wide, and a moulded depth of 31 feet, and with a deadweight cargo-carrying capacity of 8,350 tons. Following the launching a reception was held in the general offices of the company, many notables being present.

The practice of coaling transatlantic steamers on this side, for the return trip, has become additionally pronounced during the past couple of months, owing to the recent unrest in the industrial situation in England. However, this condition will probably be remedied in the near future as an agreement has been reached between the striking railroad men and the Government, whereby they will return to work while negotiations are carried on. For some time past the congestion of the docks on the other side have become so great that restrictions in shipping have been very necessary. From now on it is expected that relief will be shown in this connection.

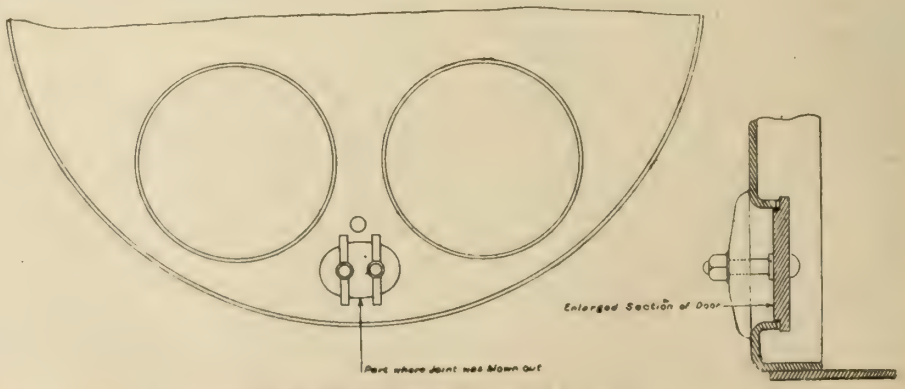


DIAGRAM SHOWING MANHOLE DOOR.

Unique Ore Unloader for Lake Steamers

This Device, Known as the W.S.M. Automatic Ore Unloader, Has Many Points of Interest Which Will Appeal to Our Readers in General

THE automatic unloader shown in the accompanying illustration is unique in design and has proved through many years of service to be a most successful device for unloading ore cargoes from lake steamers. Although of immense proportions, the design has been simplified and the control perfected to such a point that the machine is the last word in delicacy of control and operation.

The unloader consists of a main framework mounted on trucks which travel along the runway rails which are located approximately as shown in the photograph. The main framework extends back to the rear runway over a temporary storage pile where the ore can be discharged if desired. Between the front and rear runways space is provided for railroad tracks where ore-carrying cars are placed under the machines and loaded with ore for transportation to the furnace plants. The girders of the main framework form a support for runway rails on which a trolley travels. This trolley supports a balanced walking beam, from the outer end of which a stiff bucket leg depends. At the lower end of this leg is the bucket, which is operated by machinery located on the walking beam. All horizontal movements of the bucket are accomplished by means of moving the trolley backward and forward on the girders. The vertical movements of the bucket are accomplished by the operation of the walking beam. The forward portion of the beam being out of balance, the bucket descending by gravity as soon as the brakes of the hoisting mechanism are released.

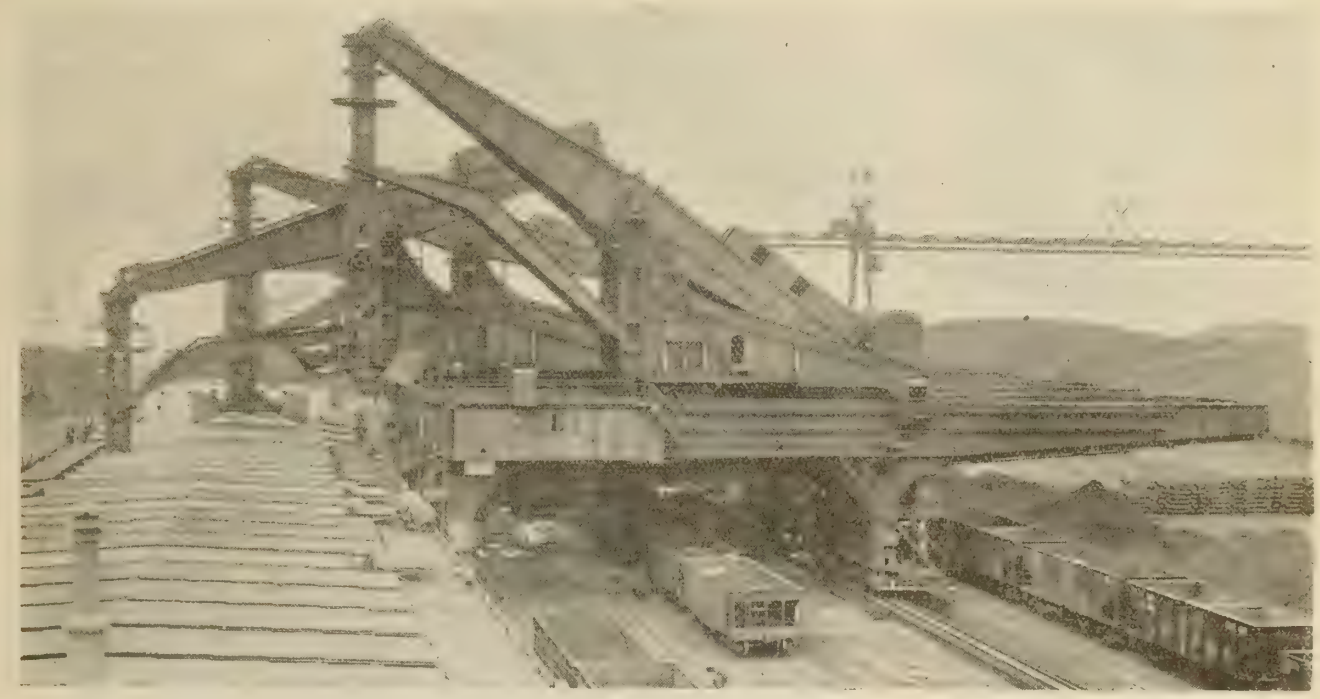
The hoisting mechanism controlling this operation is located in the enclosed house at the rear end of the walking beam. Ropes from the winding drums of this mechanism pass around sheaves located in the rear end of the trolley and are anchored to the rear end of the walking beam.

In addition to the main parts of the machine which we have described, there is also a receiving hopper located at the forward end of the main framework and between the main girders, provided for the purpose of receiving the ore discharged from the bucket. The capacity of this hopper is about three full bucket loads and its purpose is to act as a balancing point for the ore between the bucket and the cars or storage as the case may be. The bottom of the hopper is provided with outlet gates, and the contents discharged as required into a lorry, which runs on an auxiliary track suspended from the under side of the main girders.

The lorry, after receiving its load from the main hopper, moves to a point so that its contents can be discharged either into the cars standing on the railroad tracks beneath the main span of the girders or into a temporary storage pile under the cantilever at the rear of the machines. The ore so placed in this temporary stock pile cannot be reclaimed by means of these machines as their function is solely one of unloading the cargo from the ships.

Machines of this type have been made in two sizes, the smaller size having a capacity of ten tons, and the larger size (such as is shown in the photographs) having a capacity of seventeen tons in the bucket shells. The machine shown here is electrically operated throughout and its speeds are regulated so as to operate through a complete cycle in about 50 seconds.

Some idea of the capacities of unloading by this method may be derived from a record which was made in Ashtabula by eight machines of this type having a capacity of fifteen tons each, unloading seven boats having a capacity of 70,000 tons in twenty-two hours' actual time. At other points four machines working in boats having capacities up to 13,000 tons have unloaded these cargoes in about three hours and twenty-five minutes.



CLOSE UP VIEW OF THE UNLOADERS AT WORK.

The operation of the machine is as follows:

After the boat has been placed alongside of the dock, the machine is moved opposite one of the hatches and the bucket is lowered through the hatch into the ore. After filling the bucket the walking beam hoist mechanism is put in operation and the bucket hoisted out of the boat. At the same time, the trolley is traveled back so that the bucket is brought over the main hopper between the girders in the main framework and its contents is discharged into this hop-

per. The bucket is then immediately returned to the boat for another load. The ore in the main hopper is discharged into the larry which has been brought to a point directly underneath the discharge gates of the hopper. The larry hopper is filled and the larry is moved into position so as to be handled by the bucket.

The motor for operating and closing of the bucket is located in the machinery house at the back of the walking beam. Ropes from this bucket-closing mechanism are carried through the walking beam and the bucket leg and attached to a power drum in the bucket leg directly over the operator. This power drum is geared to the closing chain drums, one of which is shown on this photograph. The bucket is opened by reversing the motor and the bucket shells are forced open by means of an opening chain located in the centre of the bucket leg between the two closing chains.



DOCKS AT ASHTABULA. EIGHT UNLOADERS ARE USED, EACH WITH 15-TON BUCKET. 76,000 TONS IN 24 HOURS IN CAPACITY OF THESE DOCKS.

over the desired discharge point and the gates of the larry hopper are opened, discharging the ore as required. The larry hopper is provided with scales so that the contents is accurately weighed and recorded. In this way a car can be loaded to its allowable capacity and an accurate record kept of the amount of ore so discharged into the car, thus eliminating the necessity for the use of track scales.

If railroad cars are not available for immediate shipment the larry is traveled to a position on the rear cantilever and its contents discharged into a temporary storage pile, from which it is usually reclaimed for shipment or storage by means of a bridge located on the runway at the rear of the unloader.

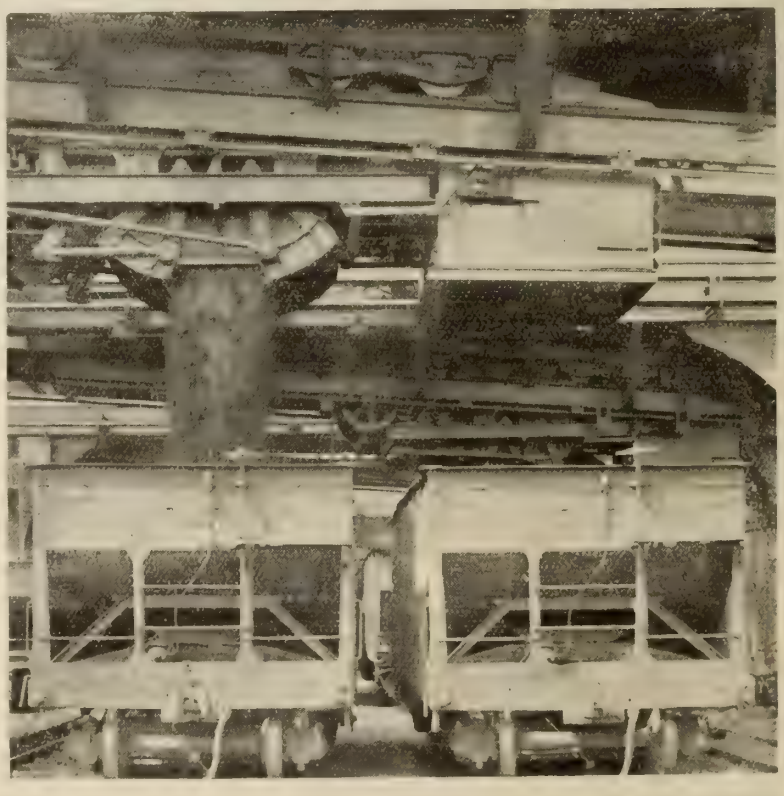
Only two operators are required for the entire operation of one of these machines. One of the operators, whose station is in the bucket leg directly over the bucket shells, controls all of the motions of raising and lowering the bucket, of traveling the trolley back and forth and moving the machine along the dock from one hatch to another. The second operator is stationed in a cab on the larry and from this station he controls the movement of the larry, the operation of this larry gates and the weighing of the ore.

The bucket shells are each made of a single piece of plate formed to the shape as shown on this photograph. These bucket shells are usually provided with manganese steel cutting lips, which are essential to resist the abrasive action of the ore. The bucket shells themselves are carried on heavy cast steel arms mounted on rollers traveling in guides in the fixed portion of the lower end of the bucket leg. The position of the operator who controls the operation of the bucket, etc., as previously described, is also shown on this photograph. The view shows the bucket in operation in the hold of the modern ore carrier after most of the ore has been removed and the balance of the ore has been scraped back in the walking beam to a rotating mechanism which is located adjacent to the bucket-closing mechanism. The bucket leg itself is carried on a roller bearing which is attached to the top end of the leg. This motion is introduced for the purpose of turning the bucket at right angles to the hatchway in order to secure as great a reach lengthwise of the boat as possible, thus the bucket is enabled to reach out under the hatches and remove ore which is not directly beneath the hatch opening. The distance from point to point of the bucket shells when open is approximately 21 feet.

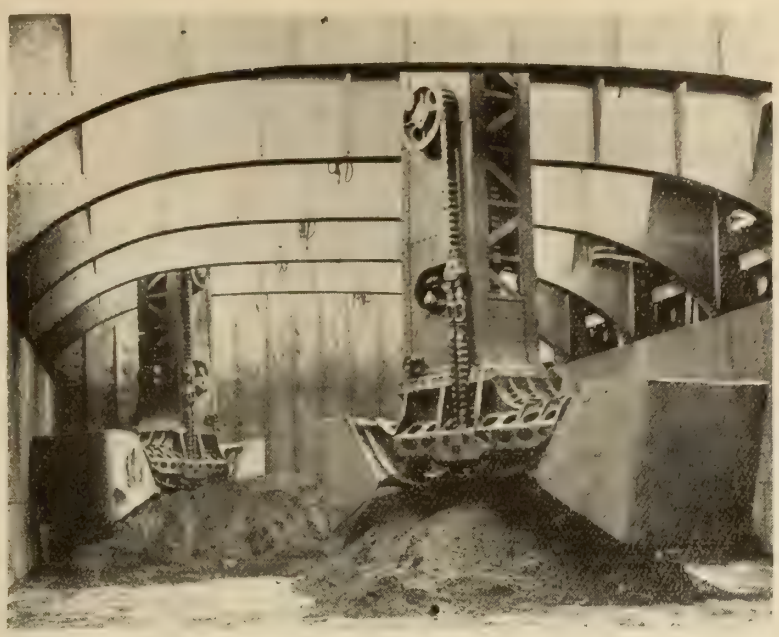
The scale larry, into which the main hopper discharges, has a capacity of between 35 and 45 tons, and two larry loads are intended to constitute a full carload of ore. The arrangement of the discharge gates of the larry is clearly shown on this photograph. They are suspended from the sides of the larry frame and operated by connecting rods which attach to cranks, also connected to the main larry frame, these gates being operated by means of a small motor which is carried at the rear of the larry. The gates are so arranged that all or a portion of the contents of the larry may be discharged. The hopper of the larry is suspended in the larry frame on scales so that the contents of the larry may be wholly or partially discharged and be accurately recorded.

The mechanism for moving the larry back and forth on its track is also located on the larry and consists of winding drums upon which ropes are wound, the end of the rope being attached to the rear end of the cantilever on the main framework. The larry track is in-

In addition to the vertical movement, which is given to the bucket leg by means of the walking beam, it also has a motion of rotation around its vertical axis. This is accomplished by means of ropes attached to a segment on the



Scale larry, into which the main hopper discharges the ore. This larry accurately weighs the ore and discharges it into storage. Cars thus loaded are ready for shipment as they do not require reweighing.



Unloader Leg and Bucket at work in the hold of a modern boat are shown above. The leg is so mounted in the walking beam that it can rotate in a circle, allowing the bucket to reach out in all directions. These machines have often unloaded 97 per cent. of a cargo without the help of shovelers. The position of the operator who controls the movements of the bucket is shown above. The distance from point to point of the bucket shell when open is 31 feet.

clined and the larry is pulled up the incline by means of these ropes and descends by gravity.

As previously stated, these machines are usually electrically operated throughout. In some cases, however, machines of the same general type have been made to operate by steam and hydraulic cylinders, water being supplied to the operating cylinders by means of a steam accumulator, which furnishes water at a pressure of 1,000 pounds per square inch. Electrically operated machines are usually designed for a 220-volt direct current. Alternating current is never used. The motors required for the equipment of one of these machines are as follows:

	Motor	H.P.
Beam hoist	1	275
Bucket closing	1	120
Bucket rotating	1	25
Trolley travel	1	120
Hopper gates	1	100
Longitudinal travel	1	100
Larry travel	1	150
Larry gates	1	40

The control equipment for these motors is of the magnetic switch type throughout, having master controllers in the operators' cabs in the bucket leg and on the larry.

Electric current is supplied to these machines by means of insulated conductor rails running the length of the main runways. The current is collected from these rails by means of pickup shoes and distributed to the various portions of the machine. A similar collecting device is also employed for supplying the main current to the trolley. Conductor rails are attached to the main framework of the machine and the current collected from these rails by means of pickup shoes attached to the trolley.

Points of superiority claimed for this Wellman-Seaver-Morgan Ore Unloader are as follows:

The design is very heavy; there is little to get out of order, resulting in low maintenance cost per ton of material handled.

The control is accurate and positive, and manual labor is reduced to a minimum.

The bucket is positively guided in passing through the hatches of ships, thus eliminating the danger of damage either to the boat or to the machines, arising from the use of rope-suspended buckets.

The operator travels with the bucket into the boat, and can always see exactly what he is doing.

The bucket is of extremely large capacity, but is so suspended from the walking beam that the weight resting on the tank top of a boat is less than one-third of the weight of a rope-suspended bucket of equal capacity. In fact it is impracticable to use a rope-operated bucket of anything like the size attained on these unloaders.

One particularly important point to be considered is the extremely low cost obtainable with these machines. Records extending over long periods show unloading cost ranging from 2½ to 4½ cents per ton, which includes superintendence, labor, repairs and materials on the machines, as well as the cost for power and light.

On account of the high capacity of these machines, the number of units required is less by a considerable margin than of a smaller type lighter machine, which results immediately in a decreased cost of operation for the reason that a fewer number of skilled operators is required.

Again, on account of the extreme reach of the bucket, it is possible for the machine to discharge a very much higher percentage of a ship's cargo than can be accomplished by ordinary rope-operated buckets. The bucket can be rotated at right angles to the hatch and reach out for ore which would be entirely inaccessible to an ordinary bucket.

It can be conclusively shown in plants where large tonnages are to be handled that there is a distinct saving in first cost as well as a yearly saving in the cost of operation over any other type of machine.

This unloader is not a combined machine. It is an unloader pure and simple, and it accomplishes its work well.

RUNNING SEMI-DIESEL ENGINES LIGHT

In the past, difficulties have been met with Semi-Diesel Crude Oil Engines in connection with running light loads. The trouble has arisen through the fact that on light load the engine consumes an extremely small quantity of fuel and the heat produced is inadequate to vaporize the fuel oil for the succeeding injections and to give complete combustion.

During the last few years Vickers-Petters Limited, in the course of their research work in connection with Semi-Diesel Crude Oil Engines, have kept this problem well to the front and have achieved a thoroughly satisfactory solution, which completely eliminates all troubles of this kind, and, in addition, enables the engine to run at slow speed with perfect combustion and regularity of ignition.

With the Petter Patent Light Running Device, means are provided for giving a supplemental injection, which is forced into the combustion chamber earlier than the normal injection.

The earlier injection is effected by giving an extra stroke to the fuel pump on the single cylinder engines, and on the multi-cylinder engines a device is fitted whereby any fuel pump may be made to deliver fuel to two cylinders at each stroke, one portion of the charge being injected into the cylinder normally supplied and at the correct timing, and the other portion is injected in advance of the normal timing. In this way each cylinder is supplied with an advanced injection.

The earlier injection of the light charges gives more time for the vaporization of the fuel oil and maintains sufficient heat in the combustion chamber to produce perfect combustion.

This means that the engine will continue to run at no load, firing regularly, without the aid of the starting lamp. The device also enables the engine to be run at slow speed with the same result. The device is operated by hand instantaneously.

The Petter Patent Light Load Running Device is a standard portion of the equipment of all Semi-Diesel Crude Oil Engines, for land and marine purposes, manufactured by Petters Limited and Vickers-Petters Limited, of 73 Queen Victoria Street, London, E.C.4, at their Yeovil and Ipswich Works.

PROGRESS IN NEW EQUIPMENT

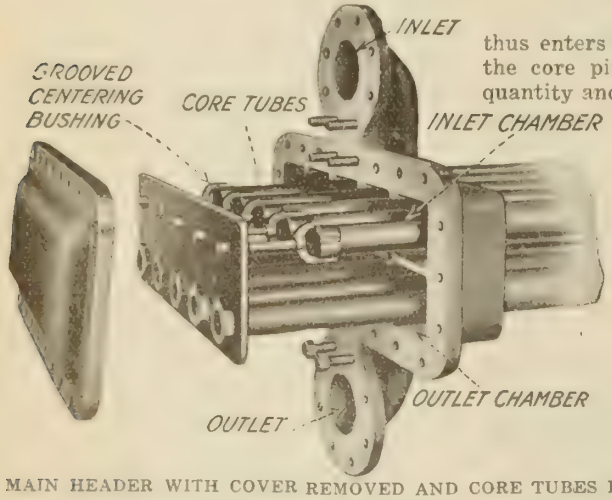
There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

THE DRAVO SUPERHEATER

In designing apparatus to superheat steam, the main objects are: simplicity, efficiency and ruggedness. It should also be readily accessible for inspection and cleaning.

These objects have all been carefully considered by the Superheater and Engineering Co., of New York, in the Dravo superheaters, the headers of which are always outside the gases of combustion and are generously dimensioned steel castings or else extra heavy pipe, as is dictated by conditions.

The tubing is seamless drawn steel tubes of suitable gauge which are expanded and flared into the headers. The openings in the headers required for expanding the tubes, are closed by means of closures made of machine steel with bolts threaded clear through and peened over. These are secured by tripod crabs and points made airtight by asbestos gaskets woven over copper netting, the gasket being placed in a pocket where it cannot blow out.



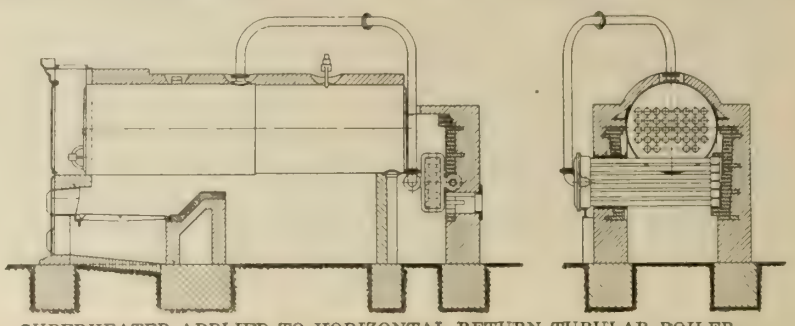
MAIN HEADER WITH COVER REMOVED AND CORE TUBES DRAWN.

The opposite ends of each two tubes are expanded and flared into cast steel connecting pieces or return bends. The openings in these castings are closed by key caps, which make a taper metal to metal joint and which the steam pressure tends to make tighter.

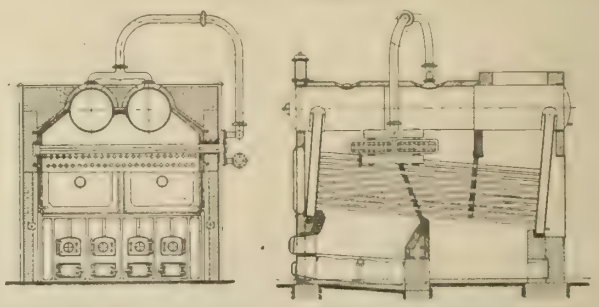
In order to efficiently heat a poor conducting medium like steam, and to do it quickly, for it is in the superheater but a short time, the steam must be brought intimately into contact with the tubes either by subdividing, filming or agitating it. Subdividing is usually done by using a number of small tubes, while filming is accomplished by means of a core within each tube, the steam passing through a comparatively small annular space. Agitating the steam as it passes through the superheater is the method employed in the Dravo superheater. The steam enters the apparatus through core pipes and through grooved bushings, which are used to secure and centre said core pipes. The core pipes are perforated and the steam which enters them is jetted through the perforations against the hot tube surfaces. It thus enters the annular space formed by the core pipes and tubes, in increasing quantity and the core pipes are decreased in size in the direction of the steam flow so that the resulting annular space is increased, thereby lessening the friction in the superheater.

The method of agitating the steam has been found to be most efficient, and the lessening of friction has made the drop in pressure very small.

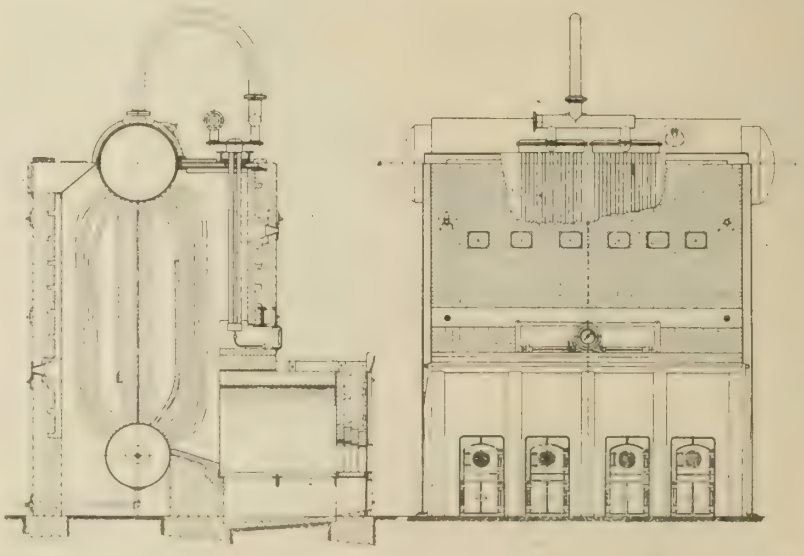
The comparatively few tubes in the Dravo superheater and their spacing offer little resistance to the passage of the gases through the boiler or its setting, thus making a drop in draft pressure due to installing the superheater almost negligible.



SUPERHEATER APPLIED TO HORIZONTAL RETURN TUBULAR BOILER.



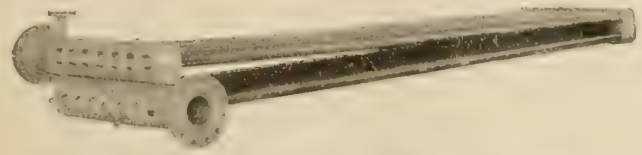
SUPERHEATER APPLIED TO WATER TUBE BOILER WITH THREE-PASS BAFFLING.



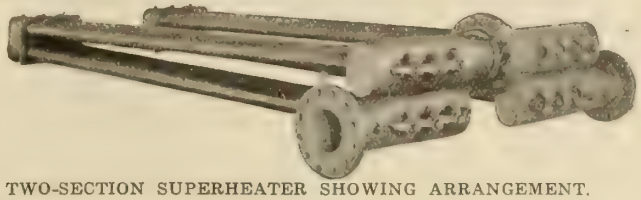
SUPERHEATER APPLIED TO ERIE CITY WATER TUBE BOILER

With the efficiency obtained by the agitating principle, the accessibility of parts, the simplicity of arrangement, the ease of cleaning, both inside and outside, and the materials used, make good the

claims of the Dravo superheater to being efficient, accessible, simple and rugged. This equipment is adapted for installation in any type of boiler setting. The illustrations show several different types of boiler settings all fitted with the superheater.



SINGLE SECTION OF SUPERHEATER.



TWO-SECTION SUPERHEATER SHOWING ARRANGEMENT.

JENKINS' NEW REGRINDING VALVES

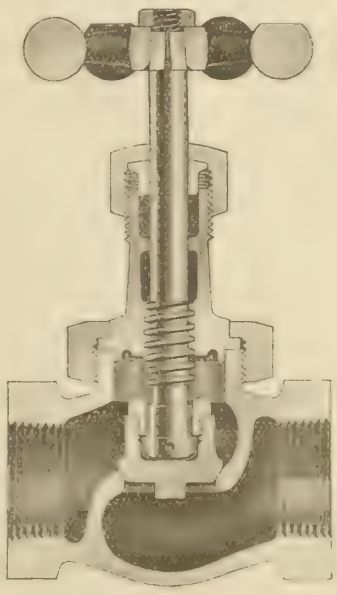
The attention of the trade is called to two new types of high duty valves that have recently been designed and placed on the market by Jenkins Bros., of Montreal. This addition to the Jenkins line has resulted from the demand in certain quarters—particularly marine and shipbuilding—for an efficient regrinding valve. Both of these valves are designed to meet all the exacting requirements of the engineering trades and are being manufactured in various styles of globe, angle, horizontal and check.

The "Reliance" has been designed for a working steam pressure of 200 pounds per square inch. The body and bonnet are made of the very best naval bronze, assuring satisfactory service under severe working conditions. The naval bronze spindle is accurately machined to limit gauges, insuring perfect fit, ease of operation, and interchangeability. The lower end of the spindle is provided with an extra heavy collar that facilitates the regrinding of the valve seat. The disc is of substantial dimensions, having a radial face where it fits the seat in the body. The stuffing box is designed for high efficiency; it is fitted with a metal gland or follower and packed with special asbestos rings of such durability that they will not require renewing for several years. Packing may be renewed while the valve is under pressure and wide open. This is accomplished by the lock nut forming a seat against the lower side of the bonnet, thus shutting off the steam or water from the stuffing box. This feature also prevents the rattling of the disc. Ends of the valves are tapped with standard pipe threads.

The "Sterling" type is of extra heavy design and suitable for a working pressure of 300 pounds per sq. in. These valves are subjected to a 800 pound hydraulic test before leaving the factory. They are similar in outward appearance to the "Reliance" valve, but the interior construction is varied to meet the added requirements of the higher pressure. The bonnet is fitted to the body by means of a ball joint. The slotted union nut permits the joint to be tightened by means of a spanner wrench, or a hardwood block and hammer. The disc in this valve is designed to minimize the cutting of the valve seat from the wire drawing of the steam. The extension below the main valve fits loosely in the valve port and holds back the steam and particles of scale until the valve is partly open, thereby preventing cutting action. The stuffing box is on the same lines as that of the "Reliance," but with a slight change in the shape of the gland or follower.

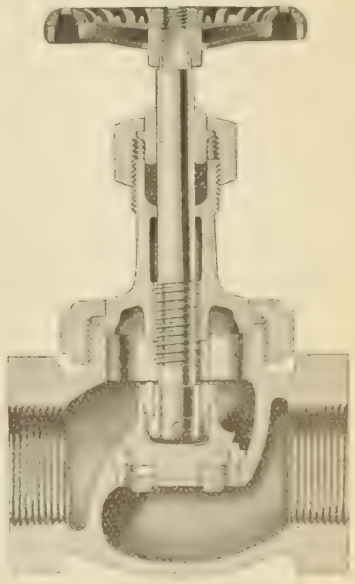
ANNOUNCEMENT

Chas. Cory & Son, Inc., main office and factory at 290 Hudson Street, New York, N.Y., have announced the opening of a new branch at 83 Columbia Street, Seattle, Wash., in order that their ships' electrical installation and repair and mechanical communicating work in this district may be more expeditiously handled. The Cory Company announces that it will carry a complete stock of marine electrical appliances and mechanical communication apparatus at their Seattle branch, which will be available for immediate deliveries.



RELIANCE TYPE OF VALVE

Halifax, N.S. — Alexander Graham Bell and F. W. Baldwin have been actively engaged for some time in Cape Breton on the development of a hydroplane boat, which has reached a speed of 71 miles an hour. The boat is called HD4. The whole boat is carried clear out of the water, the hull being supported on a series of submerged knife blades, which act as hydroplanes, thus leaving a clear space of about three feet between the bottom of the hull and the surface of the sea when she is going at full speed. The experiments have been carried on at "Beinn Breagh," Mr. Bell's residence near Baddeck, N.S. He has recently had a visit from two experts interested in torpedo work for the United States Navy. They were specially anxious to know what extra weight the HD4 could carry, so at their request Mr. Bell loaded her with 3,000 pounds of pig lead. She carried this load so easily that it was obvious she could carry more, but as Mr. Bell did not wish to put any unnecessary strains upon her, and as the naval experts declared that they were satisfied that she had demonstrated her ability of carrying navy torpedoes, he did not attempt any greater loading.



STERLING TYPE.

Most of Mr. Bell's experiments with his hydroplane boat have been made in still water, but the naval experts wanted to find what she could do in a rough sea. He and Mr. Baldwin therefore took the opportunity of trying her in a choppy sea. The demonstration was satisfactory. The hull was lifted so high out of the water that the waves were unable to pound the bottom of the boat, and she was not subjected to the punishment an ordinary flat-bottomed hydroplane boat experiences under such conditions. The shock of the waves on the hydroplane blades was so slight as to indicate that she has great possibilities as an ocean-going craft.

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Lloyd's Register Report

LLOYD'S Register of Shipping have resumed the publication of their annual report, which was first curtailed, and later discontinued during the war. The latest report, a copy of which we have been favored with, is for the year ending June, 1919, but owing to this being the first post-war report, the principal events of the period from 1914 are reviewed.

The Society's work during the war has covered many lines, and has been of great value to the Governments of not only Great Britain, but France and the United States. War conditions threw very heavy work on the surveying staff, which responded to the call in wholehearted fashion.

In addition to the usual work of surveying hulls, engines, and boilers, and inspecting marine casualties, the Society undertook the following special work:—Survey during construction of standard vessels, Admiralty and War Office vessels. The inspection and testing of war material in the United States for the British Government. The inspection and testing in the United Kingdom of war material for the French Government. Condition surveys on vessels requisitioned by the Government. Survey of vessels surrendered by Germany under the peace terms. The survey of cold stores.

This is a fairly comprehensive range of duties, and leaves no doubt as to the part played by the Society.

The large shipbuilding programme of the United States made big demands on the surveying staff. In 1916 an American committee of Lloyd's was formed in New York, and Mr. James French, principal surveyor at Glasgow, was sent out to be chief surveyor for the United States and Canada, and technical adviser to the American committee. The Society's staff of surveyors in America increased from 22 in 1914 to 124 in 1918. Ships built under their survey and classed were, in 1907, 107 vessels of 482,778 tons. In 1918, 239 vessels, of 945,912 tons, and in the year ending June, 1919, 470 vessels, of 1,883,759 tons were awarded classification in Lloyd's.

The Society had under classification in June, 1919, 4,766,623 tons, of which 2.033.319 tons were being built in the United Kingdom. During the last five years the total tonnage coming under classification was nearly 10,000,000 tons.

Some interesting particulars are given anent the progress of the Diesel engine. There are at present 69 vessels in service fitted with these engines which have been constructed under the Society's rules. Comparison between the "Vulcanus," the first sea-going vessel to be fitted with Diesel engines, and the "Glenapp," the latest, shows the advance that has been made. The "Vulcanus" was of 1,179 tons, with 6 cylinders of 15¾ inches bore and 23⅝ inches stroke, single screw. The "Glenapp" is of 7,274 tons, twin screw, 16 cylinders of 29½ inches diameter and 43 5-16 inches stroke.

In connection with the carrying of oil cargoes in bulk, certain effects have been observed on the behavior of the vessels loaded with this class of cargo. Their inertia seems to be increased, and it has been noted that a high percentage of rudder stock failures are with this type of vessel. These conditions are the subjects for investigation and experiment by the special sub-committee for research, and the William Fronde tank at the National Physical Laboratory will be utilized.

Electric welding is referred to, and reference is made to a vessel of 150 feet in length, now building, which will be entirely joined by this method.

The review contains 57 pages of matter, and is crammed full of interesting facts from beginning to end. To those who do not fully realize the scope of this Society, the review should be a liberal education, while the facts contained make it valuable to anyone interested in maritime matters.

The Dangers of the Great Lakes Seasons

By T. H. FENNER, Editor Marine Engineering

THE salt water sailor is apt to sniff contemptuously when he hears of the sailors of the great inland waters of the North American continent. He is apt to refer to that class of navigation as dry land sailing, and to couple it in his mind with the navigation of the Mississippi, where the leadsman takes his soundings in inches instead of fathoms. When he is better acquainted with the problems and dangers of Great Lakes sailing he acquires a commensurately greater respect for the responsibilities and troubles of his fresh water brother. Most deep water skippers are troubled and uneasy when making the land, especially if the weather is thick and the shore is a lee shore. Their fresh water contemporaries are nearly always comparatively close to land, and whichever way the wind blows, a lee shore is not so very far away.

These thoughts were prompted by the occurrences of the past week when in the first of the fall gales, two vessels were lost on the lakes, taking a toll of thirty human lives. The "City of Muskegon," making for port in a heavy gale of wind, was thrown bodily on to the breakwater, and foundered in fifty feet of water right at the entrance to her harbor. Most of the passengers saved their lives by jumping ashore, so close were they to safety. However, before they could all reach it the ship went down and twenty-one lives went with her. The second vessel, the "Homer Warren," was simply pounded to pieces by the heavy seas, and went to Davy Jones's locker with nine of her crew. The tenth was saved by the fact that he was not aboard the vessel, but had gone home from the last port she touched at, by train.

Last fall, three brand new trawlers, built at Fort William, and manned by deep sea crews, left Fort William for the voyage to open water. Caught in a terrific gale, two of them disappeared from sight, and took their crews with them. One of them won through to safety, but had a terrible experience. The point is that these vessels were of a type that is usually able to ride out the worst weather that can be met with in the world's open waters. Even in that nightmare of all salt water men, the North Sea at its worst, these taut little trawlers make better weather of it than much bigger ships. Lake Superior proved too much for them, and Lake Superior is not the worst of the lakes. That doubtful honor is reserved to Lake Huron.

Even Lake Ontario can present dangers sufficient for the most adventurous. An old lake sailor told the writer a story of a trip on Lake Ontario which is worthy the pen of a Clarke Russell to do it justice.

SOME years ago, the wooden steam barge "Resolute" left Port Dalhousie, loaded with about 800 tons of coal, and towing two schooner-rigged barges. She was bound for Deseronto, under normal circumstances probably a twenty to twenty-four hour run. The period when this voyage was undertaken was before the advent of that marvellous help to navigators, the wireless. The season was the late fall, about the middle of November. The weather when leaving Port Dalhousie was fine and clear, with a light breeze blowing. For the first few hours all went well, but as they proceeded northwards a change took place. The clear skies became clouded over, and the soft sighing of the breeze changed to that weird sob which usually heralds a severe blow. The wind increased, the temperature dropped, and as is always the case on these waters, the sea mounted rapidly. Before long it got so bad that the "Resolute," with her heavy tows, became unmanageable, and it was necessary to cast them adrift. Fortunately, the two barges were schooner-rigged and the crews were able to make a little sail, and bear up for shelter. This they reached safely, as was found out later, but for the time being they drop out of the picture.

Freed of her burden, the "Resolute" did better for a while. Soon, however, a new trouble developed. For some little time it had been noticed that steering was becoming more and more difficult. Examination of the rudder disclosed the reason for this. The low temperature was causing the spray thrown on the rudder pintle to freeze up and jam the rudder. When this was found out, a steam pipe was laid aft, and the jet directed down the pintle from above. This succeeded in freeing the rudder, and salt was freely sprinkled around the rudder head, which worked down the pintle and helped to keep it clear. Daylight had come by this time, but nothing could be seen but the viciously breaking waters. The captain judged his position to be somewhere near midlake, and knowing he could not hope to make Deseronto, he kept going straight down for the Thousand Islands. There was no sign of the weather abating, and all they could do was to keep the vessel riding as easily as possible. Getting down the lake in the vicinity of the Thousand Islands a fresh problem presented itself. If they went on, with the weather conditions as they were, and no clear assurance of their position, the chances were that the vessel would meet her doom on some of the rocky shores of the islands. The alternative was to turn back and run up the lake again, trusting to make Port Dalhousie. This was adopted, and after a hard struggle, the "Resolute" was turned round and headed up the lake, and to the south. As time went on the weather moderated, and finally they found themselves on a clear, bright morning close up to Port Dalhousie. This was just under five days from the time of leaving. Try to imagine five days buffeting with wind, sea, snow and ice, with land never far away, but practically out of touch with all the world. So much so that anxious families ashore had given their loved ones up as lost. The two barges, which had found shelter, had brought word of the "Resolute's" hard plight when she cast them adrift. The case seemed hopeless, and the relief was proportionately great when she came back, as it were, from the dead.

The business of the lakes must go on as does the business ashore, so once more the "Resolute," justifying her name, coaled up and started for Deseronto. Once more she left port in fine weather, and once more she ran into wintry winds and angry seas as she plodded north. Buffeting the gale, she proceeded down the lake, but as she approached the port her captain realized that he could never make it safely. He decided to proceed on to Kingston, reaching there safely and tying up after another hard struggle. Here word was received that they were to proceed to Deseronto, but feeling they had done enough, the crew signified that the only way to go to Deseronto was by train, for that season. So in Kingston she stopped.

THE classic instance of what the Great Lakes at their worst are capable of, is, of course, the terrible storm of November, 1913, which carried death and destruction on an unprecedented scale to the unfortunate ships and crews caught in it. This storm, which broke out on the 8th November, lasted till the 11th, and when it had passed on, left a trail of nineteen vessels totally destroyed. Two hundred and forty-four lives were lost. The property damage amounted to $3,157,000. All this desolation in just three days! Besides this, twenty vessels were blown

Continued on page 44



A Plea for the Better Education of Seamen

When discussing the subject of education and training of our young men and boys to become seafarers, should we not bear in mind that ships and sailors are the main artery of our international trade and commerce? If we must employ either ships or sailors who are not Canadian to transport the resources of Canada from sea to sea throughout the world, are we not destroying this artery, that which our people must rely on, to carry the power and prestige necessary to their existence, throughout the world's commercial trade routes. To overcome this, is not the development of our mercantile marine profession and the education of our future seamen of the greatest vital importance to the prosperity and security of Canada and her people?

We hear a great deal in Canada about education and technical schools for various branches of business, but what about our young men and boys starting out on a seafaring career? In the majority of cases they leave school with a very elementary education, and according to our present law they must serve on board ship two or four years in the lowest ranks of their profession and mix with all classes of humanity before they are eligible to qualify for the higher ranks of their profession. Is it therefore any cause for surprise that long before this time expires they have drifted away to such an extent that the interest they may have had has no longer the power to stimulate them with the progressive spirit necessary to lead them to the higher ideals of manhood and citizenship, and causes them to drift away and lose the respect of their communities and drag themselves and their profession into that same deplorable, stagnant, disorganized condition dominating Canada's merchant service to-day.

Is our Mercantile Marine, and the future of those who follow the profession, of such inferior importance that it does not warrant those who have the power to put forth an effort to create the facilities that will insure for these young men and boys the education necessary to the higher grades of their profession before they enter upon their career, the same as in any other profession, instead of having it divided into different periods of time, as required by our present laws?

Should there not be institutions established where young men and boys, after having passed the Junior Fourth of their elementary education, and wishing to take up a seafaring life, may have the privilege of attaining not only the scientific knowledge necessary to navigate our ships from sea to sea, but be inculcated with the idea, that in future, to a very great extent, the people of Canada shall have to rely on them to uphold and maintain the power and prestige of the Red Ensign and Maple Leaf throughout the commercial world?

To accomplish this the suggestion is offered that their education be divided into four grades, namely: First, technical education necessary to the second officer of a foreign-going vessel.

Second, the technical education required for the first officer of a foreign-going vessel.

Third, the technical education required for the master of a foreign-going vessel.

Fourth, the technical education necessary for extra master, which is simply an honorary grade requiring a higher standard of efficiency.

Further, the inspectors or examiners provided by the Government for that purpose should visit these institutions once every six months, or oftener, if it is considered in their interests. When the candidate passes one grade he should be provided with a preliminary certificate, subject to the practical experience necessary on board ship; that is, after he has received his preliminary certificate he should be required to serve the time on board ship necessary to qualify according to law, and should have to produce a recommendation from the master or masters under whom he has served, with regard to his professional ability and conduct before entitled to receive a certificate of competency. The provision should also be made that upon completing their course, graduates may be placed on board our ships as apprentices.

We venture to say that 50 per cent. of young men and boys educated in their profession as outlined will become masters and officers of our merchant ships, while the others will be endowed with a far higher standard of intelligence than they would otherwise attain, and could not fail to become greater and better citizens of Canada.

We would also humbly submit that our Government set a standard uniform, with a distinguishing mark for masters, officers and their apprentices, on Canadian merchant ships, and also when these students are in their final year they should be provided with this uniform, those in charge of their training, impressing upon them the necessity and importance of upholding the dignity they will be required to maintain with

it while traversing the world's commercial trade routes. This, we submit, will assist Canada to maintain her rightful position as a unit with the British Empire. In support of the argument for the uniform, let us picture one of our merchant ships entering a foreign port. Under present conditions, after she is moored in her berth, officials of the foreign nation come on board to interview the representatives Canada has sent to the port with her merchandise; the only stamp of Canada they can see is the flag flying at the flag staff; if they wish to interview the master or officers they must first make inquiries as to who and where they are; when they are found there is neither the emblem of their nationality nor distinguishing mark of authority to be seen. What impression would such conditions amongst the representatives of a ship and cargo coming into Canada from a foreign port leave on you? It may be that it is assumed that international power and prestige so necessary to the existence of Canada is secured through our commissioners and such other officials as may be sent from time to time throughout the world. With this we entirely disagree, believing that the international respect and prestige necessary to Canada, can only be fostered and maintained through the continual intercourse, influence, intelligence and discretion of those employed to carry on our international trade and commerce. It is obvious, therefore, that its development must, to a very great extent, remain with the masters and officers of our merchant ships, hence the importance of having them properly educated and somewhat in keeping with their position and responsibility.

We have now hundreds serving on our vessels in connection with our inland water transportation, getting a training and practical experience that cannot fail to make them seamen second to none in the world, yet the scientific education required from them is of the very crudest, thus leaving these men in a condition that they can never appreciate the higher ideals of their profession. Their position is far from satisfactory after they attain the rank of officer or master on our inland vessels. If they should have a progressive, enterprising spirit, which a great percentage of them have, to reach out and follow their profession amongst the nations of the world, they must first step down to the position of able seamen. Is that right or reasonable? How can we expect these men to take any interest in their profession and its affairs if they are to be treated in this way? Why should anyone holding a certificate of competency for chief officer on our inland waters not at least be entitled to qualify as second officer of a foreign-going vessel, or if holding a master's certificate of competency, to qualify as chief officer of a foreign-going vessel. Give these men the chance to rise to the top of their professional ambition and 75 per cent. of them will become the finest officers and masters the world ever produced. The practical training they receive on the Canadian inland waters cannot fail to produce the above result. This statement is made without prejudice and based upon careful observation and practical experience.

At the present time we understand a shipmaster may take his vessel, say, from Nova Scotia to British Columbia, through the Panama Canal, as that would be from one Canadian port to another, and comes under the head of coasting, but if his vessel should have to proceed to China or any other foreign port, he has to step down and take an inferior position. Can anyone who knows anything about seafaring, conceive the idea that the qualifications for the one voyage should be different from that of the other. Our Canadian coast-line, both on the Pacific and the Atlantic, is open to both oceans and fraught with all the conceivable dangers to navigation, then why should the time served on either of these coasts, necessary to qualify for a coasting certificate, not also qualify the candidate for a certificate of the same grade for a foreign-going vessel? It is readily understood why a restriction is made for minor waters, but when it is carried to the extent of our present laws, it becomes a serious detriment to the development of our Mercantile Marine, and the intelligence of our seamen. The day cannot fail to come when Canada's merchant seamen shall have to form a living bulwark between us and our enemies, when, if the British Empire is to remain intact, they shall have to take even a bigger and greater part than that which they so nobly took during the last four or five years.

We believe that the necessary state of preparedness can never be accomplished while the present unsatisfactory system of professional education continues to exist for our seafarers, therefore, we beg you, as the head of our profession to use your power and influence toward the betterment of our educational system and conditions.

All of which is respectfully submitted,

THE CANADIAN MERCHANT SERVICE GUILD,
W. W. INKSTER, Sec. Centre Section.

NAUTICAL ACADEMY

A Nautical Academy will be opened in Collingwood on December 1, 1919, to be conducted by Captain W. Inkster, who has been appointed to give instruction on subjects in navigation, seamanship, and all matters pertaining to the sailor's profession.

Special attention will be given to those wishing to study for the purpose of taking out certificates of competency.

Classes will be held from 9.30 a.m. until noon, and from 1.30 p.m. until 4.00 p.m. during the week, with the exception of Saturday, when classes will finish at noon. If necessary, special arrangements may be made to continue the classes during the evening from 7.00 p.m. until 9 p.m., on Monday, Wednesday and Friday each week during the winter.

Fees for masters will be $15.00, for mates, $10.00. Wheelsmen, watchmen and deck hands who have not yet served the time necessary for them to qualify for their certificates, will be charged a nominal fee of $7.00 for the winter months. All those wishing to attend these classes should advise Capt. Inkster at as early a date as possible, so that provision can be made for their convenience.

NAUTICAL SCHOOL WILL BE OPENED

A special meeting of the Board of Education was held on Tuesday evening to receive a report from the Advisory Industrial Committee respecting the Nautical School. Chairman Honeyford presided, with Messrs. Henry, Fryer, Dr. Mitchell and Toner of the Board, and Messrs. Wilson, Wescott and D. Williams of the committee present.

Mr. Wilson presented the report of the committee and also submitted the estimates of the cost of operating the proposed school. The latter showed an expenditure of $1,984, and an income by way of grants and fees of $1,481. Of the former, a considerable amount is for capital expenditure, a part which will not have to be expended in future years and a part of which will be returned by the Department of Education in annual percentages. The difference between the receipts and expenditures will be provided by the Board of Education.

The object of the class was clearly set out, namely, the training of seamen for their life work. It was also pointed out that by the establishment of such a school here it would be a means of attracting a number of marine men to Collingwood, the classes aggregating an attendance of thirty or forty.

On motion the estimates were adopted, this carrying with it the authority to the Advisory Industrial Committee to proceed with the work as outlined.

NEW CHARTER FOR SEAMEN*

Demand For International Minimum Wage and Standard Hours

The Press Association learns that a new charter for seamen of world-wide application has been drawn up which, if carried into effect, will revolutionize the conditions of service in the Mercantile Marine.

It embraces an international minimum wage and uniform working hours, standards of accommodation and victualling, compensation for loss of life, accident and loss of effects, and the establishment of an International Joint Marine Industrial Council.

Mr. G. N. Barnes, M P., delegate from the British Government to the International Labour Conference to be held at Washington, in conformity with the

*Lloyd's List.

Peace Treaty, recently received a deputation from the Seafarers' Joint Council, headed by Mr. J. Havelock Wilson, M.P., who discussed with him the arrangements for summoning, in connection with the Washington Conference, an international meeting devoted exclusively to the affairs of the seamen.



SS. "LAKE MANITOBA" ON FIRE IN MONTREAL.

At the request of Mr. Barnes, the Seafarers' Council have now formulated their demands, which are as follows:—

(1) International minimum wage.

(2) International load line (table of free board).

(3) International prohibition or limitation of deck loads.

(4) International life-saving appliances.

(5) International manning scale.

(6) International standard of accommodation on board ship.

(7) International hours of labour at sea and in port, and a standard number of days to the month.

(8) International standard of victualing and serving of food.

(9) Right of seamen to portion of wages earned and standing to their credit when in a foreign port.

(10) Payment of wages to commence from date of signing articles, and to terminate on day crew are paid off.

(11) In case of shipwreck, payment of wages to continue until seamen reach home.

(12) International standard of compensation for loss of life, accidents, and loss of effects.

(13) Pilotage (a) Compulsory (b) Restrictions as to nationality; (c) Ship's officers not to undertake pilotage duties.

(14) Reconstruction of wireless maritime telegraph service.

(15) Establishment of National Joint Maritime Councils and an International Joint Maritime Industrial Council.

Great Britain is the first of the countries who will take part in the forthcoming World Labour Parliament to prepare a programme of demands on behalf of seamen.

THE WHITE STAR LINE*

Ensuring British Control

The following communication was issued recently by the White Star Line:—

At a meeting of the Oceanic Steam Navigation Company, Ltd., held in Liverpool to-day, the Chairman, Mr. Harold Sanderson, stated that the meeting had been called to ratify an agreement recently entered into with the Admiralty and the Board of Trade, and to consider proposals for the alteration of the Articles of Association, to enable such agreement to be carried into effect.

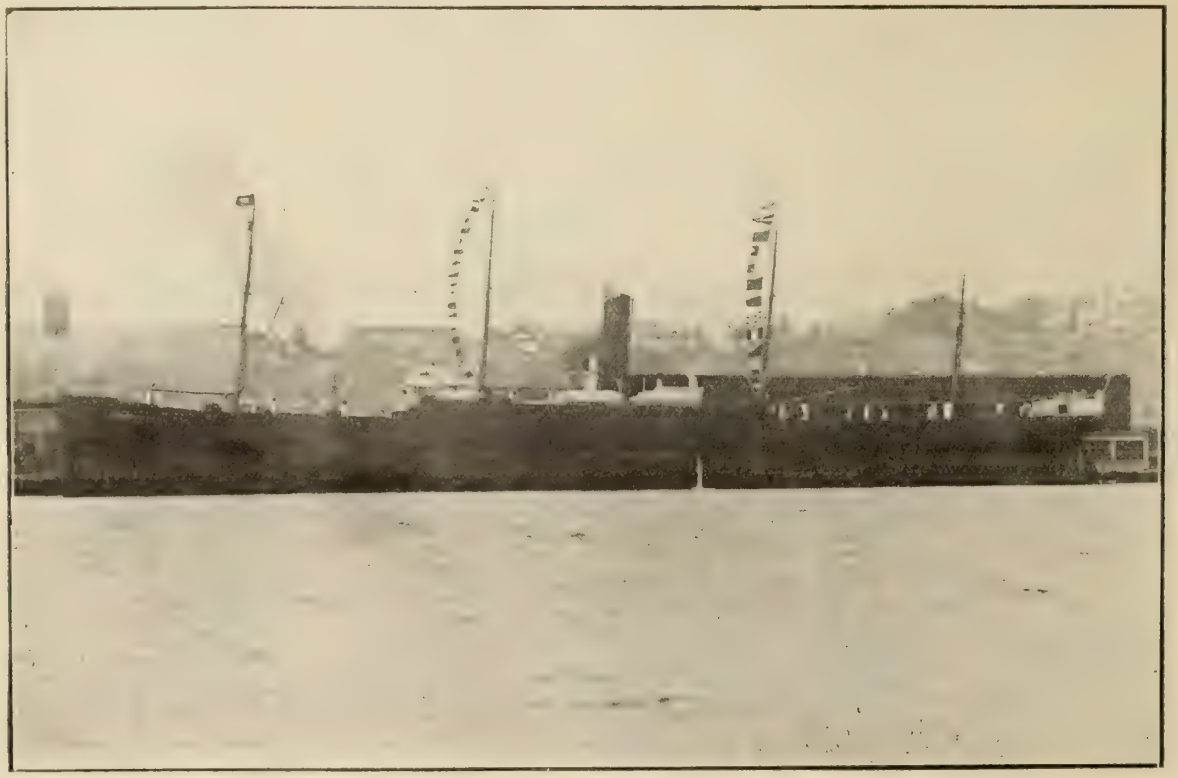
The proposals before the meetinng, if adopted, would place on record and embody in the constitution of the Company the practice hitherto followed, under which the management and operation of the steamships would be, and remain, in the hands of the Directors, who had always been British citizens and resident in this country. In regard to Directors to be hereafter appointed, provision was being made for their being acceptable to the Board of Trade.

On this basis, His Majesty's Government placed on record that the Company was not to be considered a foreign-controlled company.

The proposals were carried unanimously.

*Lloyd's list.

It is understood that the foregoing line of action is essential in order that the White Star Line may continue to operate as a British steamship company under the British flag. The difficulty



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which the White Star Line had to face in preserving its continuity of British interests (as in the case, also, of the Leyland Line, which has passed similar resolutions) was that so many of the shares were held in the United States, and the holders might, conceivably, be able to exercise an influence upon a policy of the Company detrimental to the shipping interests of Great Britain and favourable to those of the United States.

The adoption of the requirements of the Board of Trade and the Admiralty obviates such a likelihood, and it will be noted that the choice of Directors practically ensures that the White Star Line in practice, whatever its share register may denote, will, as heretofore, be a powerful factor in the maintenance of British maritime supremacy.

*Lloyd's List

THE GREAT LAKES SEASONS

(Continued from page 375)

ashore, receiving damage to the extent of almost half a million dollars. The vessels lost and stranded were of all sizes, from 2,800 tons d.w. to 10,000 tons d.w., and besides the distinctive lake type of carrier, included vessels of the tramp type. These were built in Great Britain, fit and seaworthy to navigate any waters that would float them. Eight of the vessels disappeared totally, among them being the "Wexford," a British-built ocean-going tramp. The "Charles S. Price," a 9,000 ton lake carrier, was found after the storm floating bottom up, with her bow end out of water. Later she, too, sank completely.

The wind at its maximum attained a velocity of 79 miles an hour, and averaged 60 miles an hour, and raised such a sea as has, perhaps, never been raised on the lakes before or since. Vessels running before the wind were continually pooped, the seas filling the engine room, and smashing every deck erection in its path. Those headed into it found it impossible to keep their vessels head up, and they gradually fell off into the trough, where they were pounded by the heavy seas till they foundered, or were driven ashore and smashed to pieces.

That gale will live long in the memory of Lake sailors, and the inhabitants of the towns and villages of the lake shores. It ranks among the great marine disasters of the world, and it is to be hoped that the inland waters will never suffer such another catastrophe.

At the time this happened, much speculation was rife among the uninformed, and among many that should have known better, as to why these ships could not survive a heavy blow. Salt water men pointed out that the British-built tramp did not founder, but was driven ashore, a very different happening. They claim that had the vessel had sea room, she could have lived through any gale. This is practically true.

The answer of the lake sailor is that their vessels are not intended or built to stand such conditions. They are built for carrying a heavy bulk cargo on the least possible draught. They have the reports of a capable weather bureau to guide them, and if bad weather threatens, they remain in port. If on their voyage, and conditions become adverse, they can usually gain shelter. They point out that the percentage of loss to total traffic is decidedly low, but when a loss occurs it is usually of a spectacular character, which focuses attention on it. It practically amounts to the fact that a lake carrier, caught in a heavy storm, stands a good chance of being lost. On the other hand, an ocean-going vessel takes storm and calm all in the day's work, and unless close on a dead lee shore, does not worry much.

If the two types of vessel are studied a little, the reason is apparent. Take two vessels of the same tonnage, one an ocean-going vessel, and the other a bulk carrier of the lake type. A 10,000 ton d.w. ocean-going steamer will have dimensions of approximately 450 feet long by 56 feet beam by 38 feet deep. She will have engines developing 4,000 h.p. The lake carrier of the same size will be 524 feet long by 54 feet beam by 30 feet deep. Here is a great difference. Her engines will be only 2,200 h.p. A greater difference still. The ocean-going steamer has her engines and boilers amidships, and in the bottom, and light or loaded, trims on a practically even keel. The lake boat, on the other hand, has her engines right aft, and the boilers usually set in the 'tween deck. She trims by the stern, and when running light, there is a difference of 10 or 12 feet between the draught aft and forward. Now, what are the conditions of the two vessels in the same waters, and the same weather? The ocean-going ship, full loaded, will be drawing about 29 ft. She has ample power, and steers well. The lake boat will be drawing roughly about 19 or 20 feet. It is at once apparent that of the two vessels the ocean-going steamer is easier to handle. The extra length, less draught, and low power of the lake steamer makes her, in severe weather, almost unmanageable. In very severe weather she becomes helpless. Then again the sea that runs on the lakes is very high, with short intervals between the waves. These seas break very quickly, and the effect is a series of hammer-like blows delivered unceasingly. The fabric cannot resist it if long continued. Now, in open water the seas are long, and a vessel has time to rise and fall to them. Very rarely does the bulk of the sea break on a vessel. It is usually just the crest of the sea that falls on the deck. When a vessel does get under the weight of a real Atlantic roller, she comes into port with her upper works levelled to the deck, and a story of a tidal wave.

I have tried to show in this limited space what the mariners of the Great Lakes have to contend with. As a salt water man, I feel a deep respect for them and their work, and would like to see Canadians in general take a deeper interest in this phase of their national life.

PERSONAL

Captain Oscar R. Dakin has been appointed harbor master for the Port of Digby, N.S., succeeding the late Capt. Howard Anderson.

Sir Nathaniel Dunlop, formerly chairman of the Allan Line Steamship Company, died recently in England. He was largely responsible for the introduction of the turbine type of engine into ocean-going vessels.

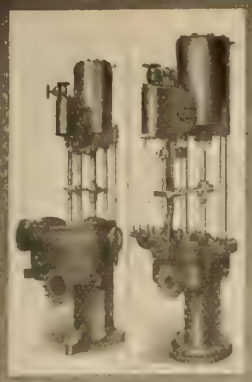
Hiram McLean, of the shipbuilding firm of McLean and McKay, died recently at his home in Truro, N.S., at the age of 49. The firm just recently completed the tern schooners, "Truro Queen" and the "Acadia Queen," at Economy.

Captain J. W. Harrison has been appointed marine superintendent for Canada and Newfoundland for the shipping firm of Furness, Withy & Company. Capt. Harrison has been associated with this company, in their Halifax office, for the past twenty years, and prior to that was master of the Furness steamers.

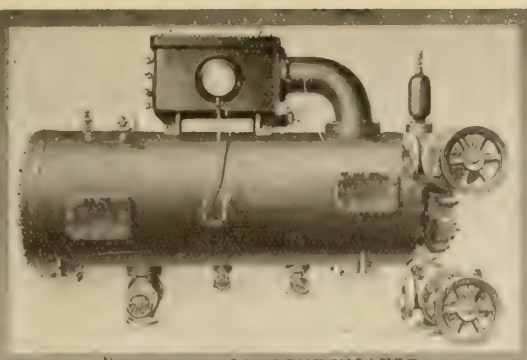
Commander William Turner, R.N.R., who was in command of the Lusitania when that vessel was torpedoed, has retired from active service. It might be stated that Commander Turner was placed in charge of the ill-fated vessel at the very last moment owing to the illness of the regular officer, Captain Dow. Commander Turner was also in command of the steamer Ivernia when she was torpedoed in the Mediterranean. He entered the services of the Cunard Company as a deck boy in 1878, and rose to take charge of their largest vessels. He has many awards and honors for life-saving and other special service.

At a recent meeting of the Montreal Board of Trade considerable opposition was advanced regarding the proposed advance in wharfage rates that the Harbor Commissioners intend putting into effect at the beginning of the year. It was decided that the council of the Board of Trade interview the Commission to see what can be done as to the withdrawal of the proposed advance, and if this cannot be done, to suggest that the matter of the increase be deferred for a time so that the board may have time to bring the whole matter to the attention of the Government.

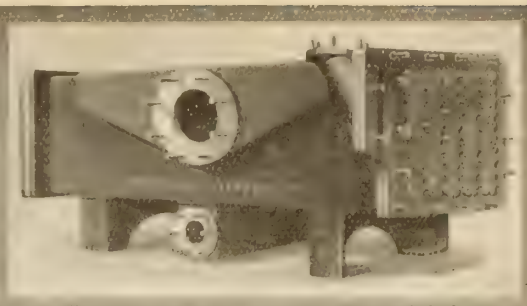
That steps are being taken to relieve the shortage of ocean tonnage is shown in the recent announcement of A. G. Henderson, one of the Glasgow directors of the Cunard and Anchor lines, when he stated that quite a number of vessels were now under construction for the Atlantic trade of his company. In addition to providing increased tonnage for the old trade routes, the companies are preparing for other new routes as post-war requirements demand. Mr. Henderson intimated that some of these new boats would probably be ready for the Montreal route for the opening of the season of 1920.



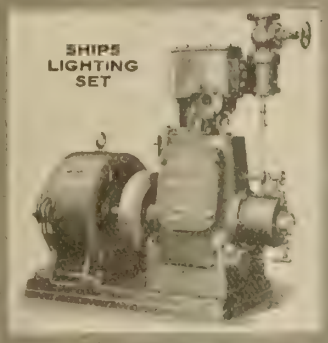
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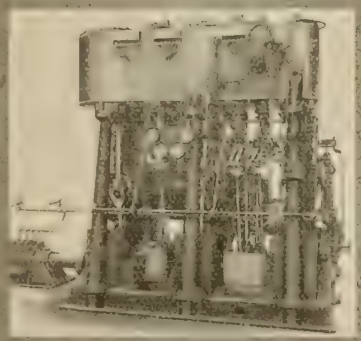
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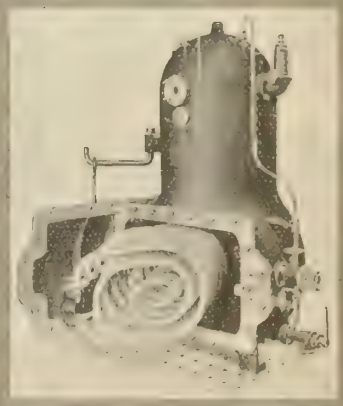
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MARINE NEWS FROM EVERY SOURCE

Fort William.—The Nichols Chemical Company are about to erect a 600-foot dock and loading hoists on the mission. The dock will be located near the Grand Trunk Pacific property.

Cleveland.—Owing to a combination of heavy weather, together with a low temperature that made the handling of ore difficult, there are about twenty-five steamers waiting for cargoes at Duluth. Several steamers which were from twelve to twenty-four hours overdue have arrived safely.

Collingwood.—The Collingwood Shipbuilding Company have carried out successful trials on the "Canadian Gunner," the fourth vessel built by them recently, and she will be handed over to her owners immediately. She was built for C.G.M.M., and will sail from Montreal about the 15th November.

Port. Arthur.—In the recent heavy wind and snow storm on Lake Superior, fifteen vessels, including the Assiniboia and the Huronic, were compelled to seek shelter behind islands. The steamers Glen Ellen and Glen Lyon, which were considerably overdue and the cause of much anxiety, have arrived safely at Fort William.

Detroit.—The United States Shipping Board have sold the steamers "Seneca" and "Bethlehem" to Great Lakes owners. The steamers will be delivered at Boston. The Seneca has arrived at Boston, and the Bethlehem will leave Portland for Boston as soon as she is discharged. The new owners are in Boston awaiting the vessels.

Washington.—Due to the strike of bituminous coal miners, orders have been issued to discontinue coaling of foreign vessels in American ports. The U.S. Government have been advised that it is just possible to take care of American requirements, so all other vessels will have to obtain their bunkers elsewhere, presumably Canada.

Guernsey.—At the entrance to the Russell Channel leading to St. Peters Port, Guernsey, Channel Islands, a lighthouse has been erected which is entirely controlled from the shore by means of a cable about 1½ miles long. This cable is of very strong construction, and carries current to control the light, and also the foghorn. The horn has been heard on the French coast 34 miles away. The lighthouse is called the Platte Fougere.

Ottawa—Up to date 15 ships have been delivered to the Canadian Government Merchant Marine, and are in service There have been 25 sailings, and the tonnage carried aggregates 116,000 tons.

Halifax.—Mr. Harry T. Sailor, of New York, has purchased the new four-masted schooner "Breakers," built in Yarmouth for the American Balso Company. She will be renamed the "Balso" and placed under the United States flag. Capt. Dixon, late of the United States Shipping Board, has assumed command.

Bridgeburg.—The crew of the ferry steamer "Orleans," owned by the International Ferry Company, quit work without any notice. They wanted an increase of pay, but the captain claims that they did not ask for it, but just quit. After some hours a new crew was shipped at the same rate of pay, and the old crew have started work at the shipyard.

Buffalo.—The bow of the steamer "Northland," which has been cut in two at the yard of the Cowles Shipyard, is now ready to leave Buffalo for Levis, Quebec. The Northland has been purchased by the Davey Shipbuilding Co., of Levis, which company purchased the bow end of the Northwest. The stern end of the Northland will be ready to leave very soon after the bow.

Cleveland.—The end of the lake season is nearly at hand. More than sixty hulk freighters have been sent to their winter quarters. There is a scarcity of cargoes. The cold weather in the Northwest has held up the ore movement. Steamers are taking cargoes to hold, as there is little storage room on the docks, and furnaces are unable to take it.

Cleveland.—There is very little shipment of grain, and most of the ore shippers are cleaned up. There may be better movement of grain at the beginning of the month, but many boats are being tied up. Several steamers have taken short cargoes during the week. Cold weather at the head of the lakes had the effect of delaying ore shipments, as the ore was frozen, and had to be thawed out before loading.

Toronto.—The old "Chicora," one of the most interesting vessels on the Great Lakes, foundered at her moorings at the foot of Cherry Street, through a leak of some sort. It is surmised that the packing may have got out of one of the seacocks, or something of that nature. The water came in faster than the pumps of the salvage boats, hastily summoned, could remove it, and she sank, snapping her mooring ropes as she went down. She will be removed.

Bridgeburg.—The Canadian Allis-Chalmers have completed the steamers "War Magic" and "War Vixen," and they will have their trial trips at once. The yard has been working overtime in order to complete the vessels before the close of navigation. They are the standard 2,500 tons size built for the Imperial Munitions Board. There are two other vessels on the ways.

Grimsby.—A dredge that was being towed from Grimsby by the tug St. Paul, broke away from the tug during heavy weather, and sank almost immediately. Here the crew were taken off, but one man named John McLaughlin, was taken down by the craft and drowned. Two scows which were in tow were washed ashore later. They carried no crew.

Montreal.—The "War Raccoon" has arrived down from Toronto and will go into the dry-dock of the Canadian Vickers Co. before loading a cargo of lumber. She was built for the Imperial Munitions Board and is owned by Tyzack & Brantfoot, Newcastle-on-Tyne. Another new vessel in the port is the "New Toronto," built for the Elder, Dempster Line by Harland & Wolff for the Canada-South African service. She will sail about November 5.

Shipbuilding Returns.—Lloyd's Register of Shipping gives the vessels under construction at the end of September as 5,230.000 outside of the United Kingdom, and 2.800,000 tons in the U. K. Of the vessels being built abroad, 2,584,000 tons are under Lloyd's classification.

New Steamship Services.—New services are being inaugurated by the Canadian Government Merchant Marine and between Buenos Ayres and Monte Video and Canada, and also a service from Vancouver to the Mediterranean and Black Sea ports. These new lines will make their initial sailings in October.

Lyall Shipyard For Sale.—The Lyall Shipyard in North Vancouver is advertised for sale, there being no further work in sight for it. The yard was started for the purpose of building wooden ships, and 40,000 tons of these vessels were constructed. During its building activity, the yard consumed 22.000.000 feet of Douglas fir, and spent $2,500,000 in wages. At its busiest period it employed 1,400 men.

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Returned Soldiers and Sailors and Widows and Dependents of Soldiers and Sailors killed in the War may obtain supplies, for their own personal use and not for re-sale, through the nearest branch of the Great War Veterans' Association who will combine individual orders and forward to the War Purhcasing Commission through the Dominion Command of the Great War Veterans' Association. These services are rendered by the Great War Veterans' Association to all parties in the class named, whether members of the Great War Veterans' Association or not.

All communications should be addressed to the Secretary, War Purchasing Commission, Booth Building, Ottawa, who will be glad to supply lists and further details to those interested.

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Secretary of the Navy

10-29-19

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—of this interesting catalog, telling more about this modern scientific method of building tackle blocks will be sent promptly upon request.

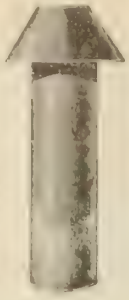
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Are now made in two types only

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The difference between these two is one of lubrication—VS-7 is gravity, while the VS-8 is forced feed—both systems have their friends.

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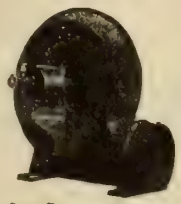
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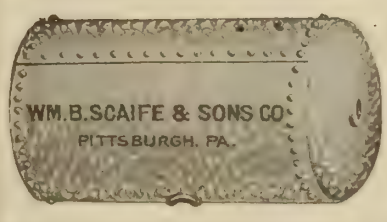
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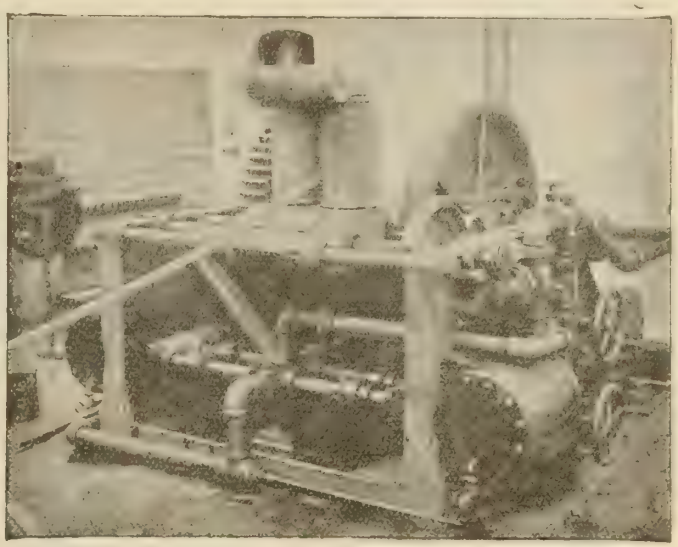
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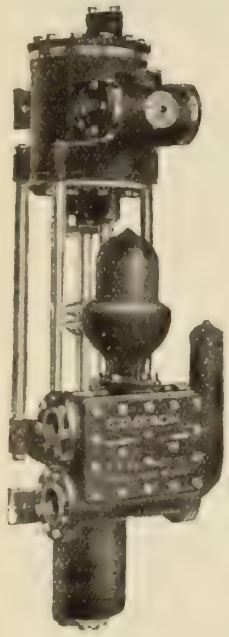


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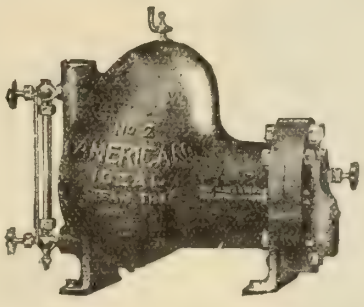
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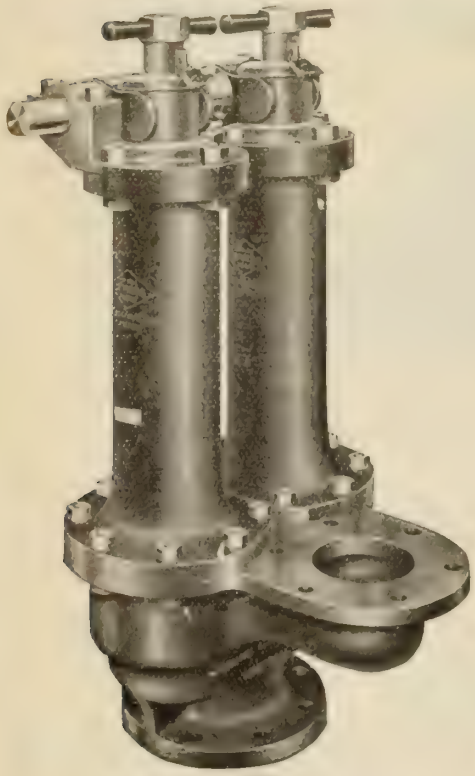
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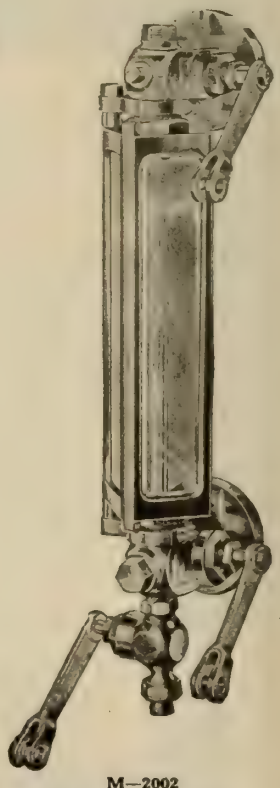
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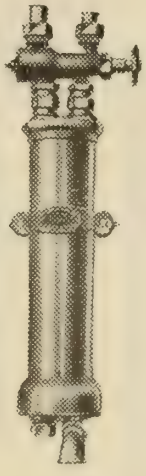
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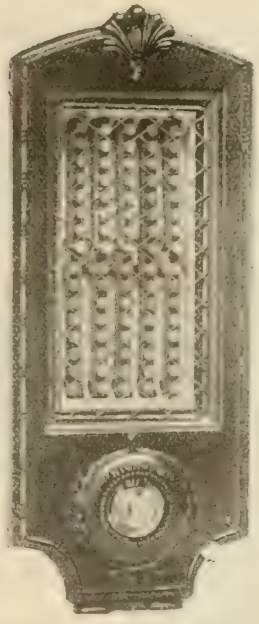
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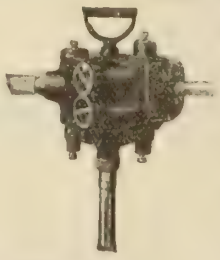
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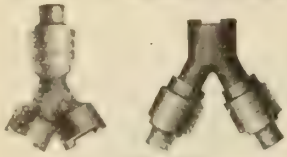
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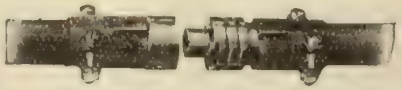


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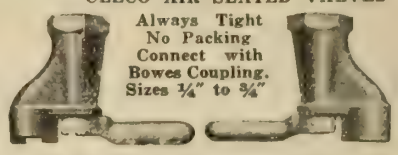
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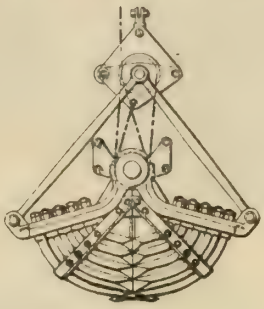
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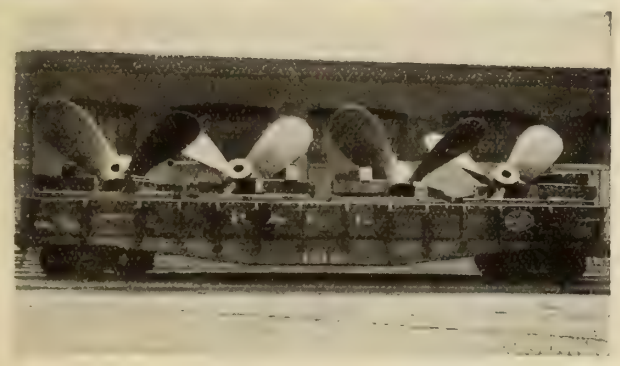
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Bronze and Semi-Steel Propellers

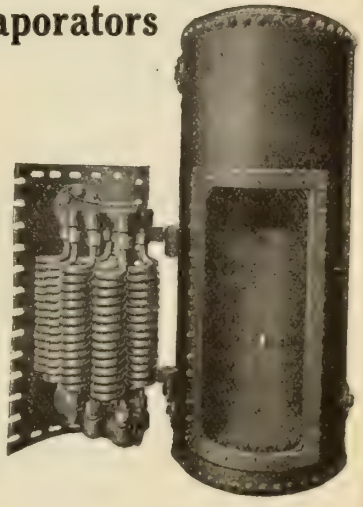
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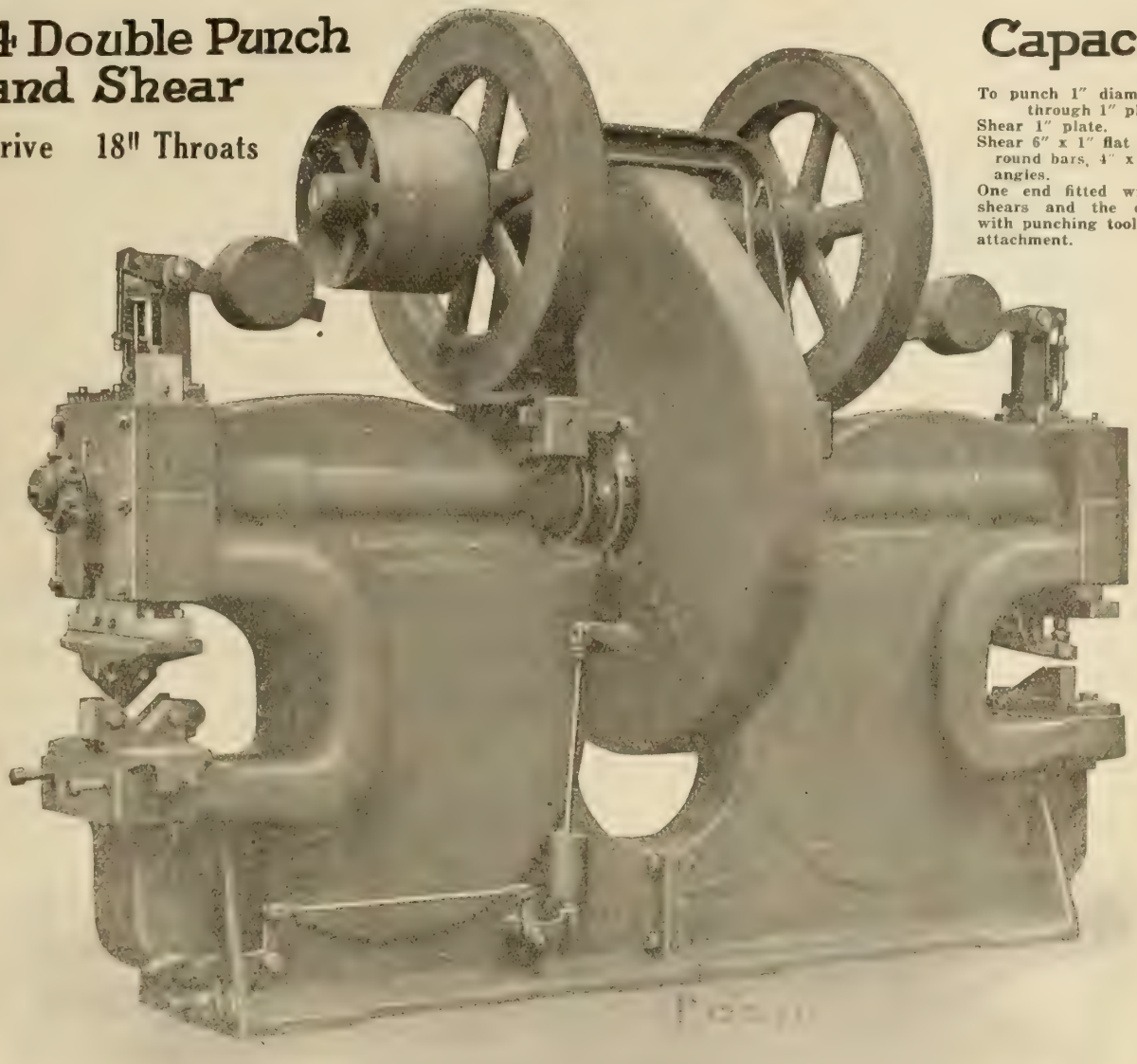
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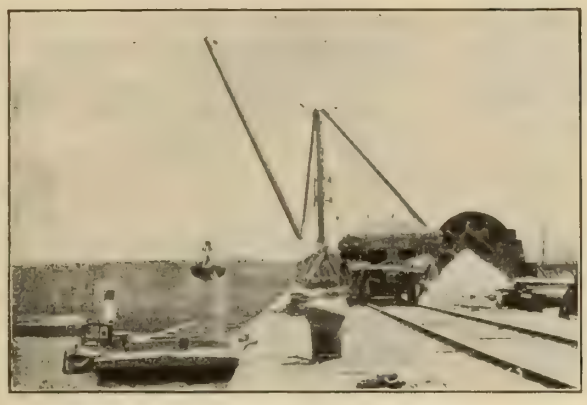
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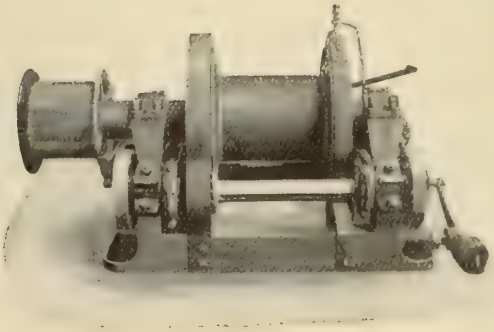


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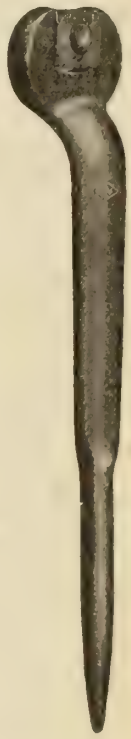


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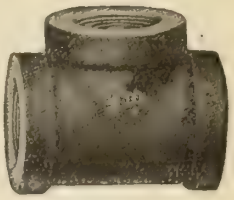


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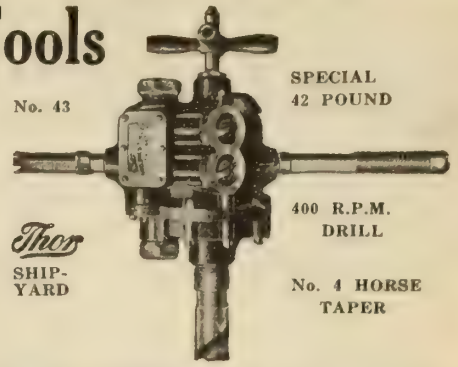
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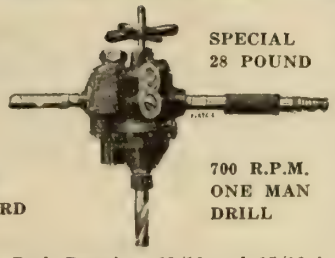
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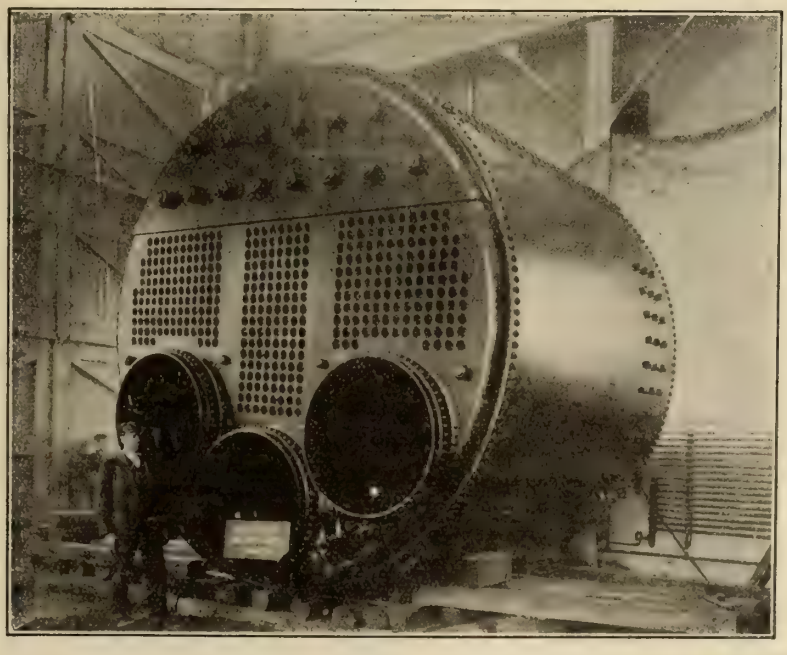
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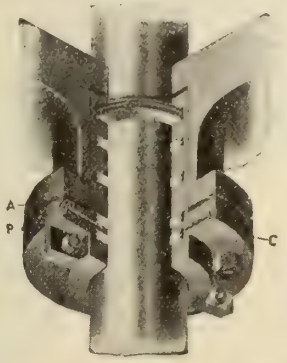


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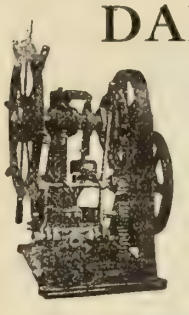
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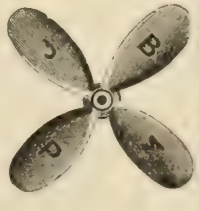
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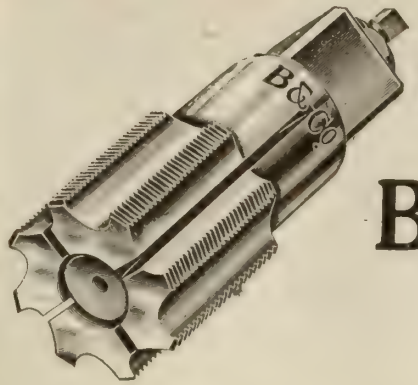
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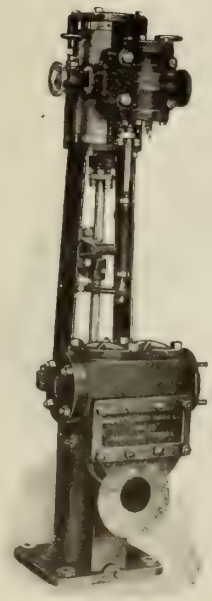
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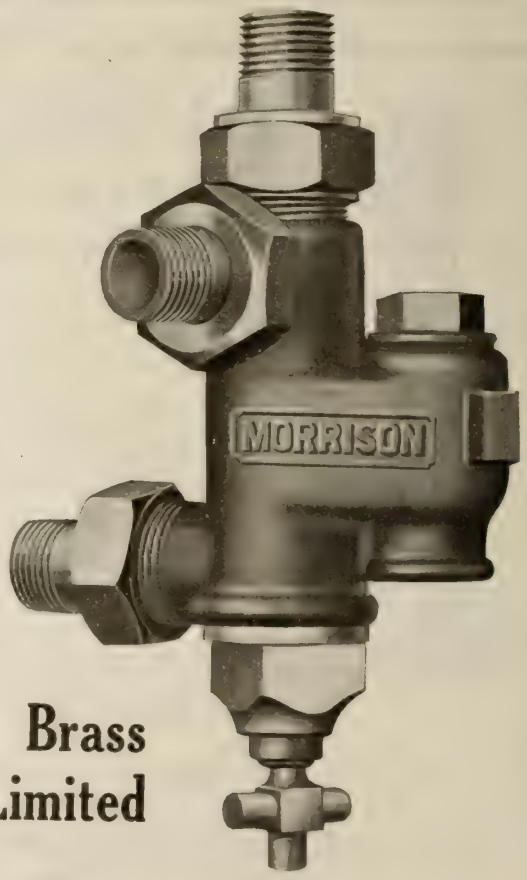
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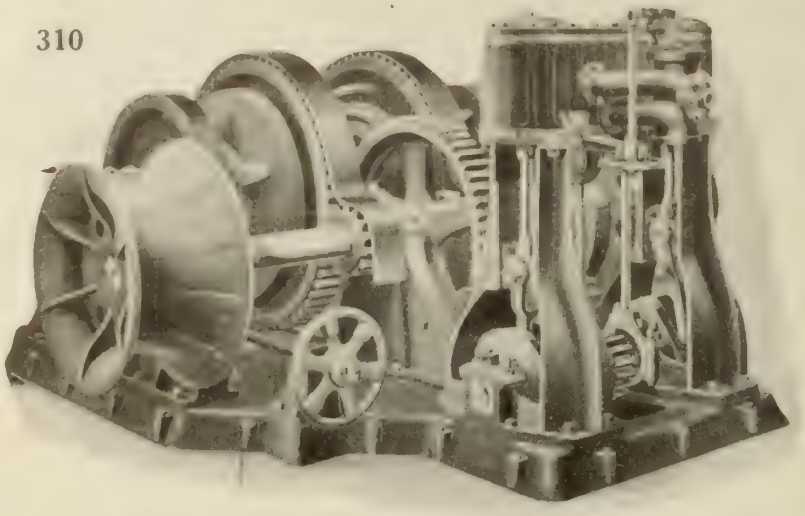
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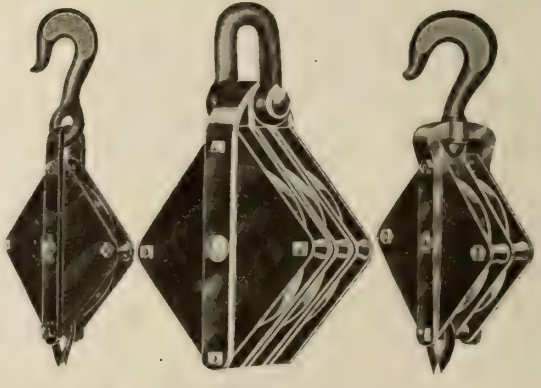
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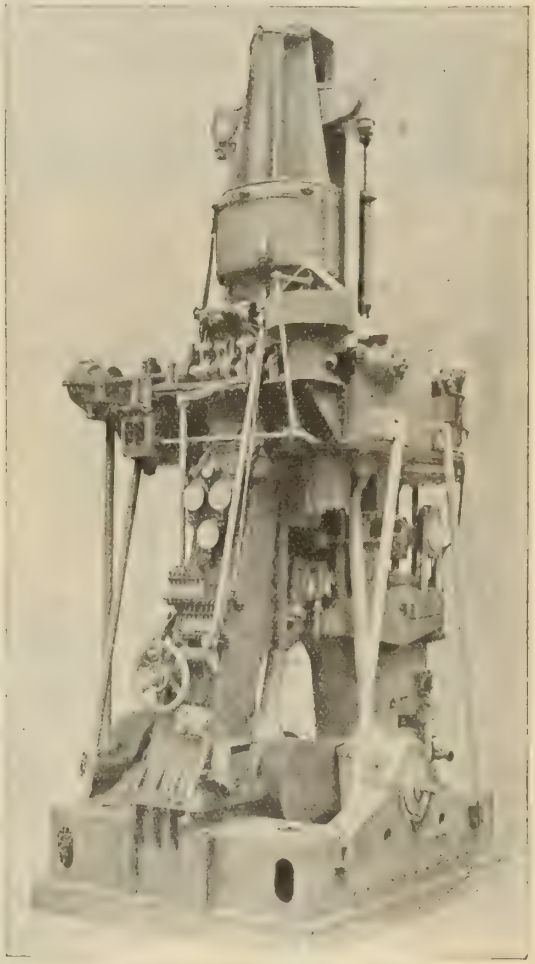
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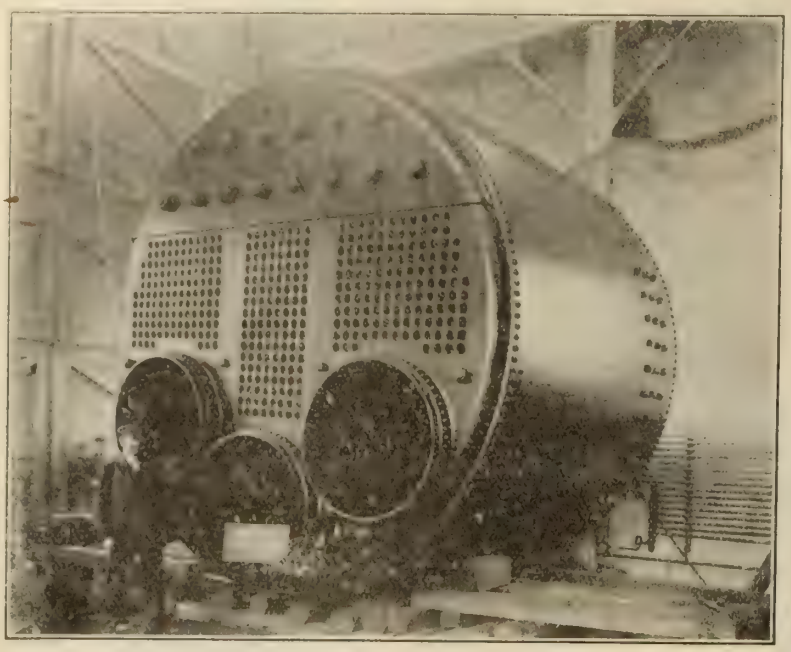
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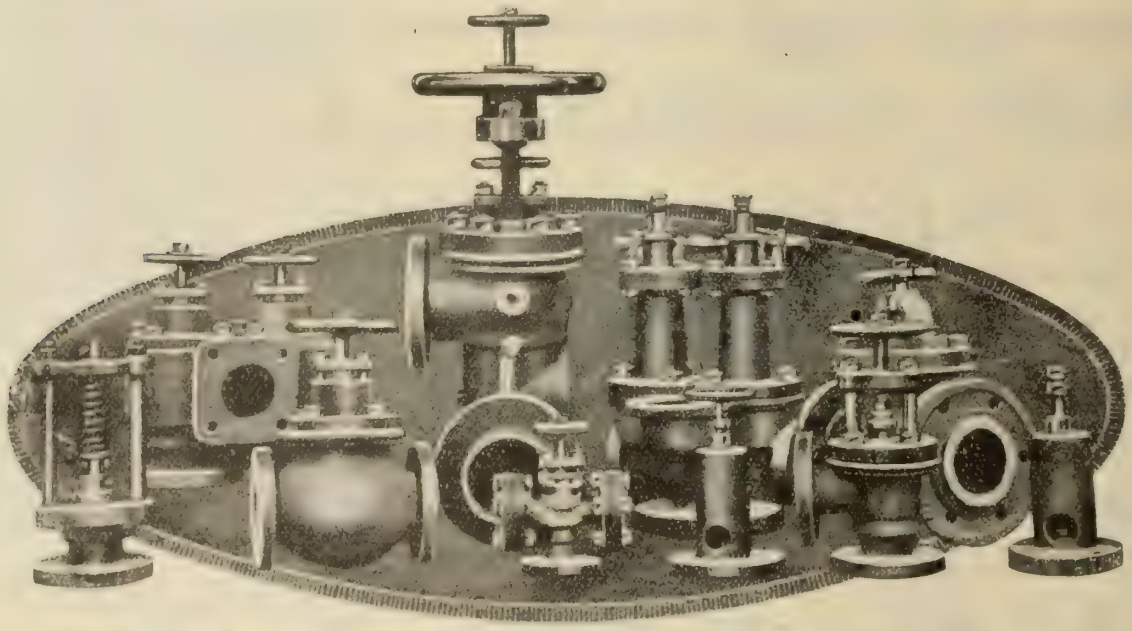
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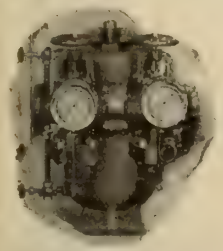


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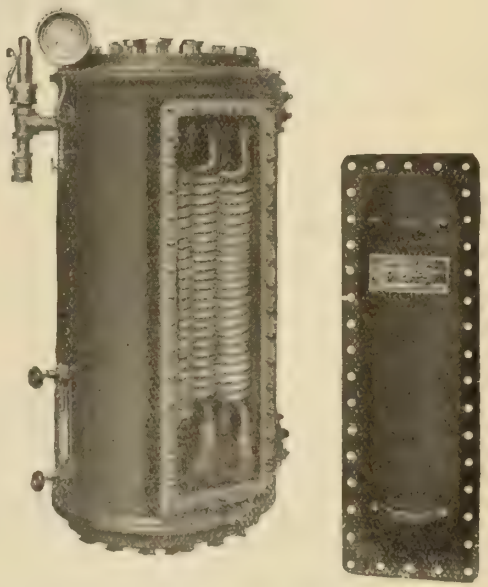
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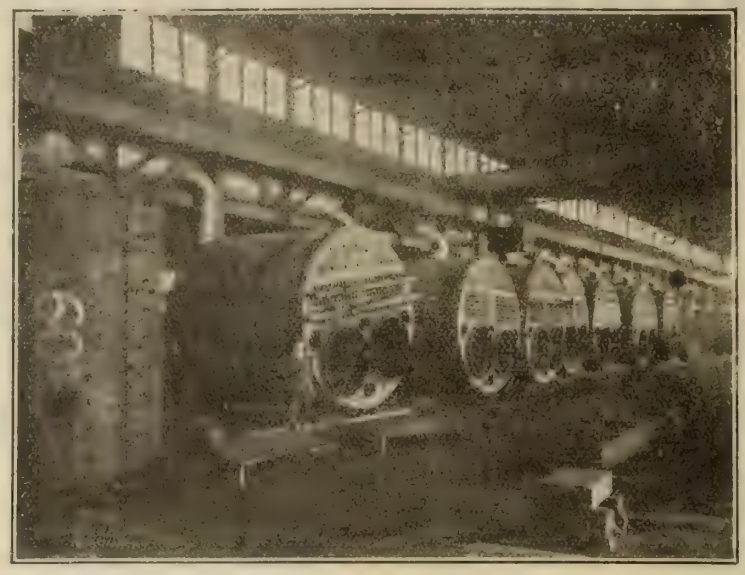
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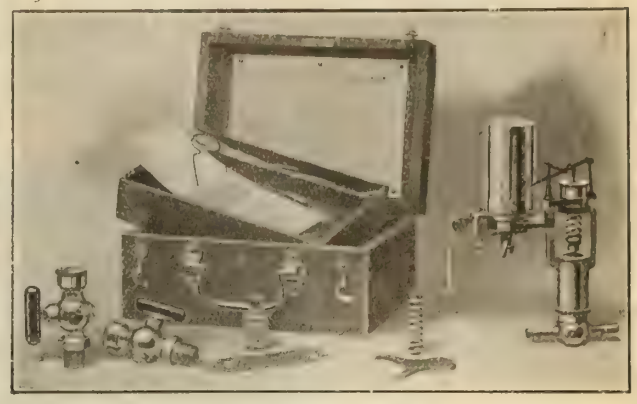
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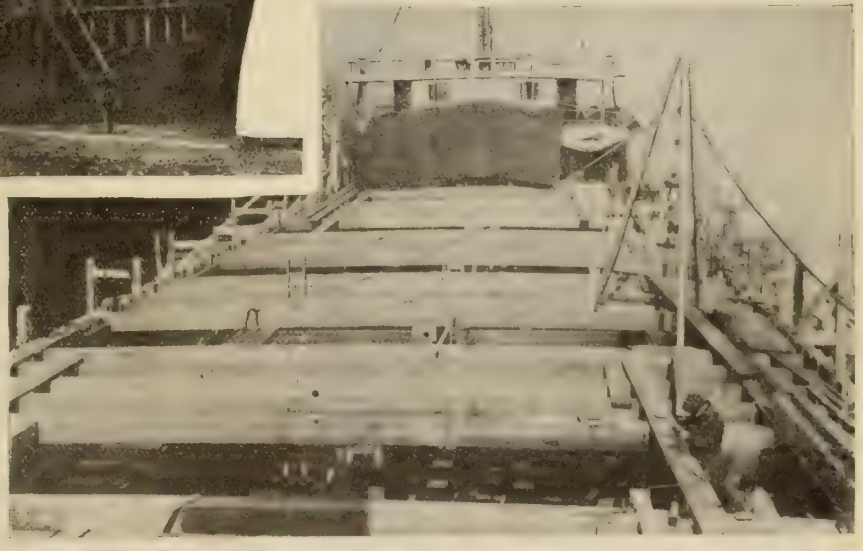
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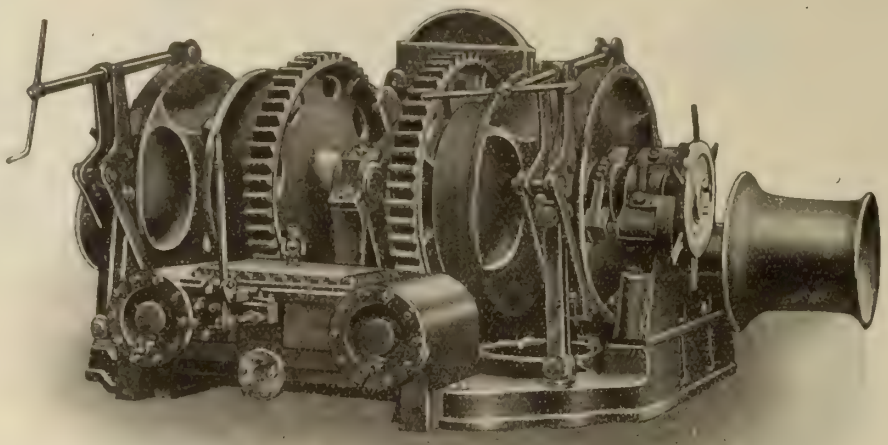
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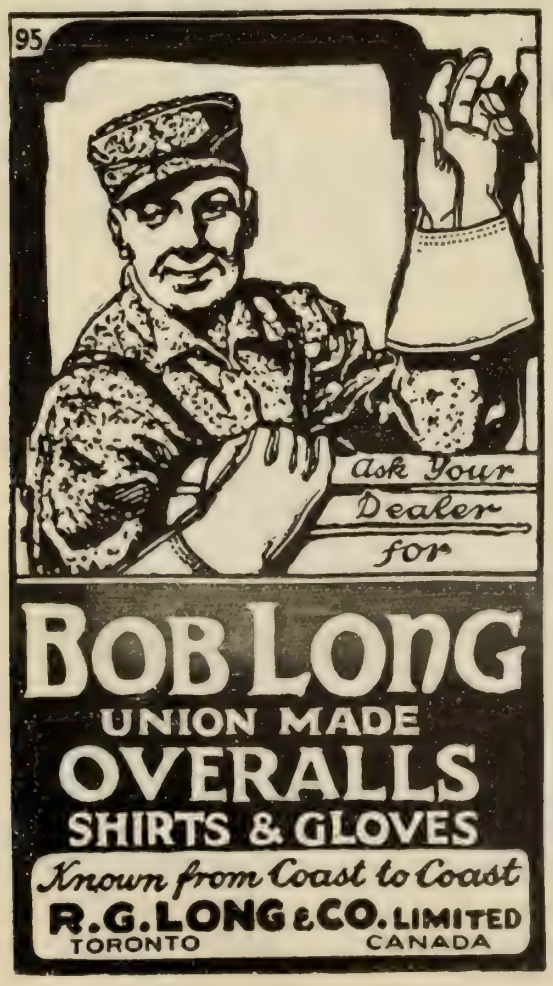


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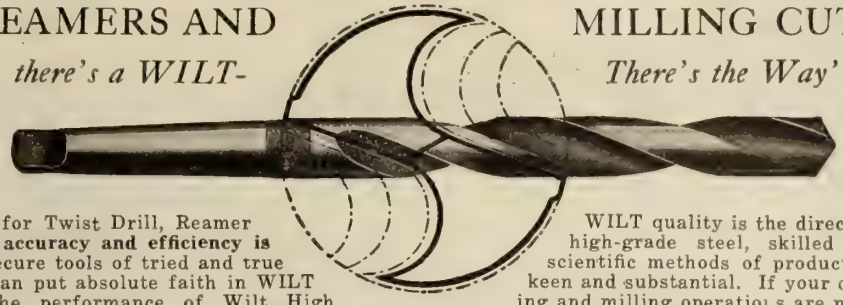
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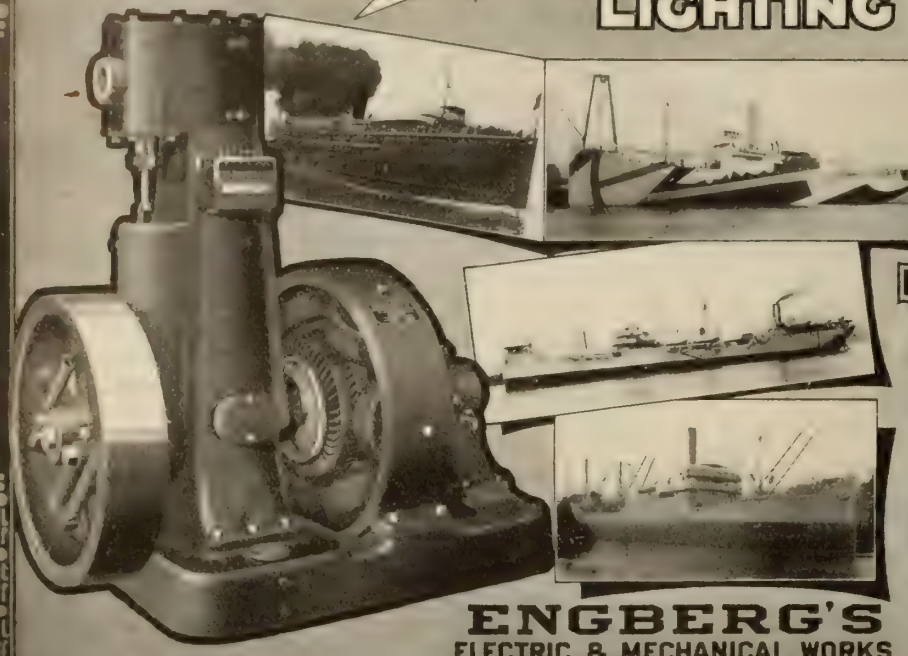
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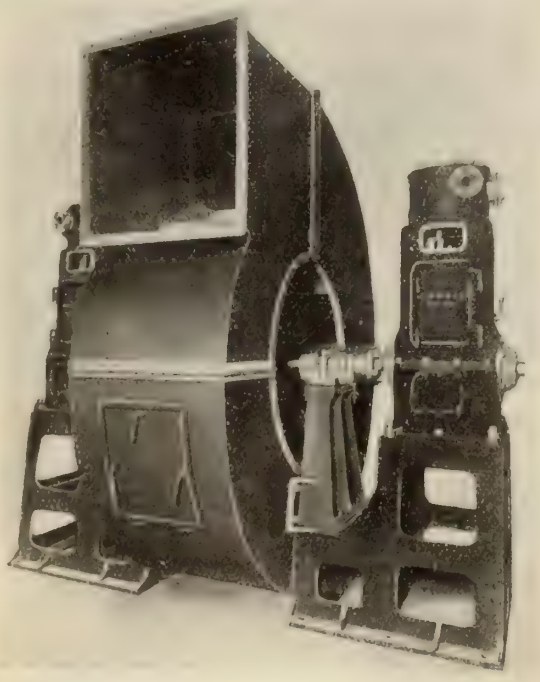
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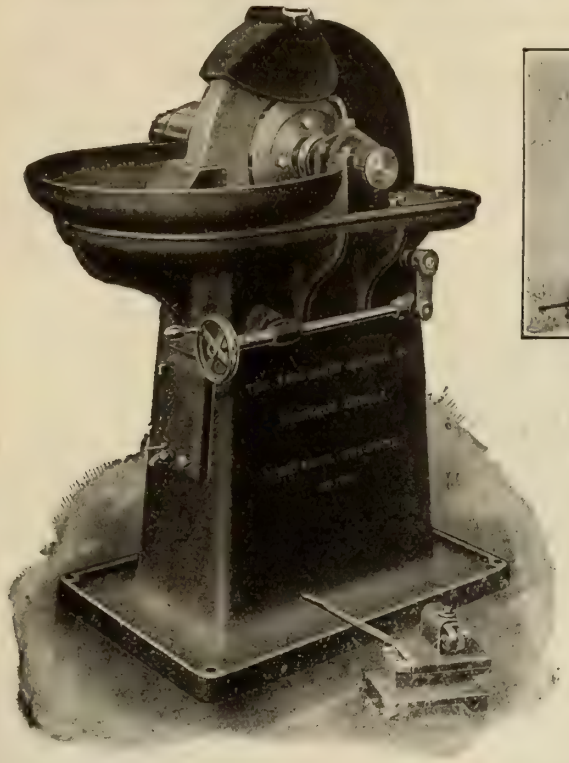
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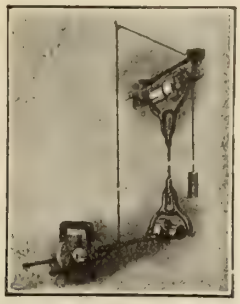
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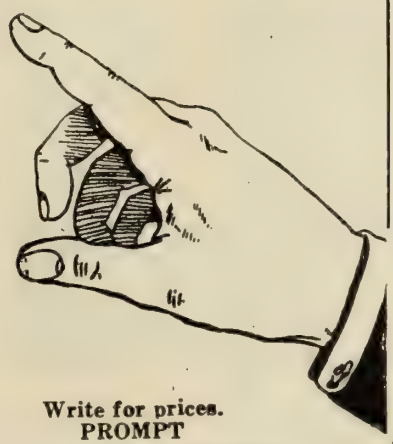
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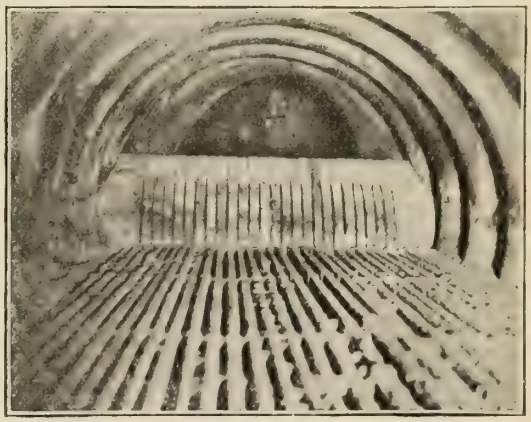
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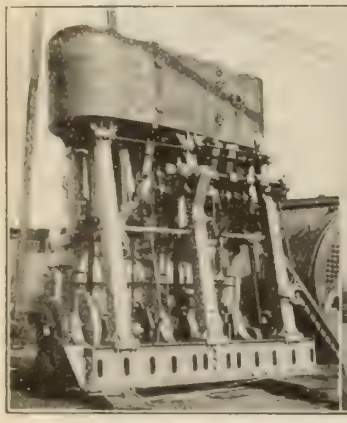
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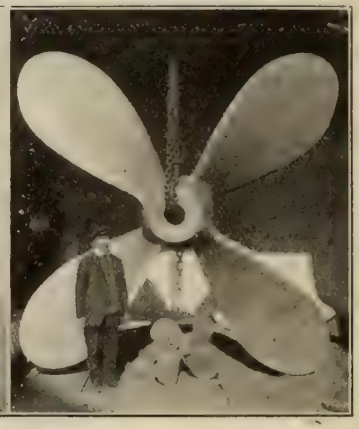
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Vol. IX. TORONTO, DECEMBER, 1919. Number 12

Developing the Marine Engine and Auxiliary

The Firm of Goldie & McCulloch, of Galt, Turned to the Manufacture of Marine, Steam Engines and Marine Auxiliary Equipment—A Large Number of Installations Have Been Made

By T. H. FENNER

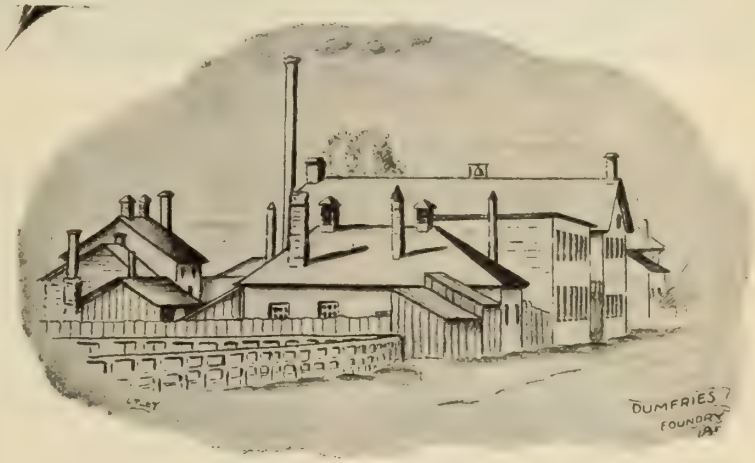
IF it had been suggested to the owner of the old Dumfries Foundry, in Galt, that seventy years later the little place would have grown into one of the leading engineering firms of Canada, he might have been doubtful. Yet, that is what has happened.

Founded in 1844 as a general foundry and machine shop, it was taken over from the original owner, in 1849, by the fathers of the present heads of the firm. From then till the present day is one long story of progress.

Seventy years from its inception, the firm stands strong and progressive, directed by the second generation of the founder's family, and still a private company.

From the start, the policy of the firm was to turn out a well-finished article, and once they went into the making of stationary engines and boilers, they soon became well known. Their well-known types, the Wheelock, the heavy duty Corliss, Ideal High Speed, were well-known all over Canada, as were their horizontal return-tube boilers. With the more general use of motor drives instead of belt drives, the necessity of a compact, high-speed engine that could be direct-connected to a generator, was felt. The answer to that was the Goldie-McCulloch high-speed vertical compound or triple enclosed engine. These engines have achieved as favorable a name for themselves as the earlier products of the firm, and are now almost as widely distributed over the country. A further development was the manufacture of their water-tube boiler. This boiler is manufactured entirely on the plant, the intricate forgings, or rather pressings, which form the staggered leader and the cross box being part of it.

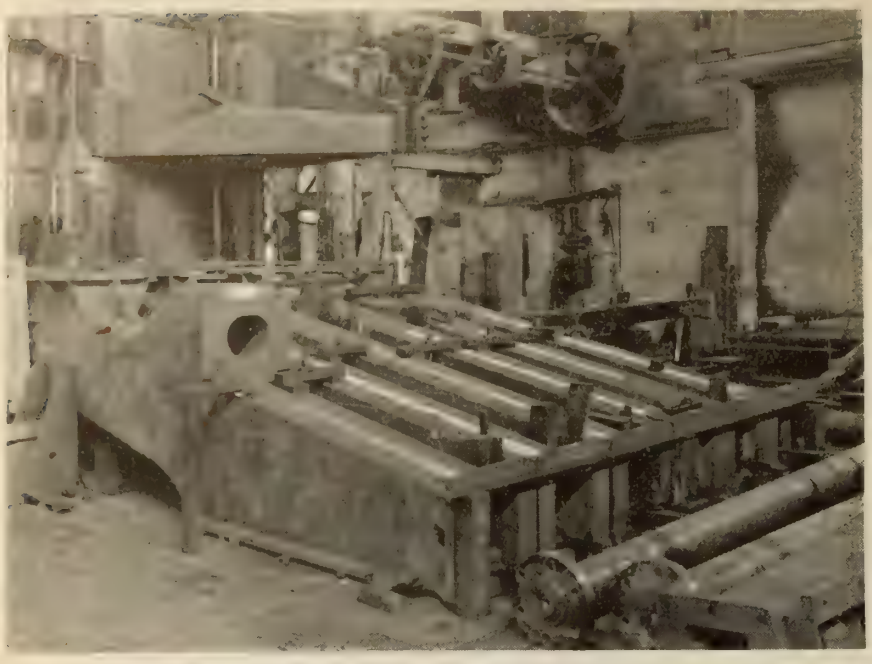
It is not surprising that a firm with the experience and record that this company has, should come to the front when a still greater development became necessary. With Canada's entrance into the realms of shipbuilding, a new era was opened for Canadian engine builders. It was something new for them to undertake, the requirements for marine work being different to those for stationary. The castings were larger, heavier, and more complicated. The forgings required were also heavier, and there was, also, the added complications of link motions, and engine-driven air, feed, and bilge pumps. However, the firm we are speaking of went into



THE ORIGINAL SHOP



CRANK SHAFT, TAIL END SHAFT AND PROPELLERS.



A GROUP OF COLUMNS ON OPEN SIDE PLANER.

it with a will, and achieved some remarkable results, although at the same time they were turning out large quantities of finished shells and shell forgings, and many of their machines and most skilled men were not available for the marine work.

The entrance of the firm into the marine field was about February, 1917, when the Naval Department were building their program of trawlers and drifters. From the start of their marine activities, the firm's production of marine engines and auxiliaries have been on a quantity basis. The list of work turned out from March, 1917, to date, will give some idea of the results achieved, and makes very interesting reading. Here it is:

40 Sets of Compound Expansion Engines for Drifters, with attached pumps and surface condensers. These engines were of the 12 in. x 24 in. x 16 in. stroke size, for the Naval Service Department. These engines were complete from main stop valve to propeller.

14 Sets, the same as above, for the French Government, 1,500 ton, wooden ships.

2 Sets of 12¾ in. x 2½ in. x 35 in. x 24 in. Trawler engines, complete from stop valve to propellers, for the Naval Service Department.

12 Sets, same size, for the French Government, vessels built by the Foundation Company, Victoria, B.C.

3 Sets of Triple Expansion Engines, 25 in. x 41 in. x 68 in. x 45 in., for Canadian Merchant Marine.

All of these sets were complete, with shafting, thrust block, stern tubes and propellers.

80 Complete lines of Tail-end and Tunnel Shafting, including plummer blocks, stern tubes, stern gland, for French ships.

300 Vertical Forced Lubrication Engines of the high-speed type, for driving lighting sets, forced draught fans, centrifugal pumps.

32 Contraflo Winch and Main Condensers. (These were extra to about 61 Condensers supplied with various of the above engines.)

Many sets Contraflo heaters, filters, Cascade tanks, etc. Also 6 complete sets cylinders, 25 in. x 41 in. x 68 in. x 45 in., with covers, etc., machined and jointed, ready to go on columns; also 6 sets compound cylinders, 12 in. x 26 in. x 16 in., finished in the same manner; and several sets of heelplate and column castings for large engines.

Besides these, the firm have made a large number of sidelights, ballast pumps, feed pumps, of the centrifugal, as well as the reciprocating types. The Morrison radial evaporator has also been made in large numbers.

This record, for a firm that had never gone into marine work of any kind be-



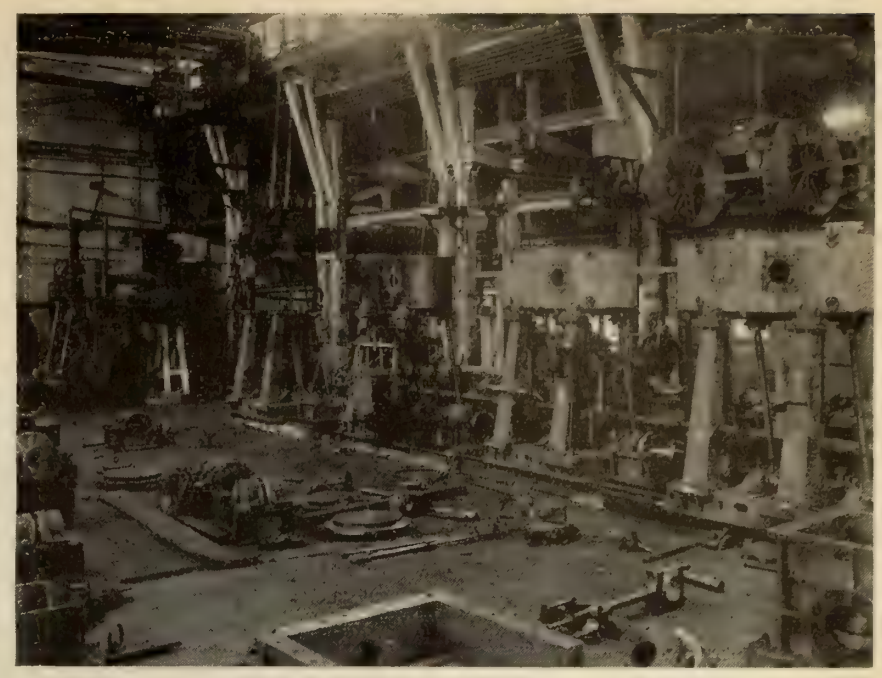
THE SOUTH WORKS

fore, is certainly a good one. They had the benefit of a very efficient works force, many of their men having been with them for a long period. The excellence of finish and workmanship always shown on their stationary work was immediately available on the marine work. Speaking of the long service of many of the employees, the writer noticed a letter posted on the wall of the shop, tendering the good wishes of the employees to one of their number who was retiring, after forty-one years in the Company's service. A large number of the men own their own homes, and this fact tends to a stability of labor, which stood the Company in good stead through the troublous times of the last two or three years. Labor troubles in the Goldie-McCulloch plant are a thing unknown.

There is still another branch of the firm's activities which has always been a part of it, and is now going stronger than ever. This is the safe, vault and safety deposit box branch. One of the pleasing features of this department is the large number of veterans employed in it. In fact, it is almost entirely run by returned men. The large demand, by small investors, for safety deposit boxes in the banks where their accounts are kept, has stimulated the manufacture of these articles. There is work on order to keep this department busy for the next two years.

The Plant

There is something very substantial about the look of the plant, as one approaches it. The grey stone buildings, well clad with clinging plants, proclaim the fact that here is no mushroom growth. In fact, the City of Galt has a large proportion of stone buildings, grey with age, making one's mind revert back to the Old Country.



COMPOUND ENGINES IN ERECTING SHOP.

The main part of the plant is contained in the old or South works. At the other end of the town is the North works, a new steel and brick building, devoted to the manufacture of horizontal return tubular and water-tube boilers, and tank work.

The main office is situated at the South works, and is contained in a separate building. The offices, general and private, are on the ground floor, while upstairs is the drawing office and the advertising department, in conjunction with which is a very complete photographic department.

The shop buildings are built in the form of two L's, with a building in the space between the two long legs of the main buildings. All the buildings are of grey stone, with heavy timber supports for the roof.

An electric motor truck runs all through the yard and the shops for handling material between the different departments, and the natural lay of the ground has been utilized in the arrangement of the foundry. The ground at the back of the plant rises sharply, and the



THE NORTH WORKS

cupolas are situated at this end. The raw material is brought to the charging platforms on trucks, the level of the [illegible] being practically that of the charging platform.

The Foundry

The foundry is contained in the east end of the south main building. As mentioned before, the cupolas, of which there are three, are situated at the extreme end. These are of different capacities, and are used as required, giving a capacity up to 25-ton castings.

Alongside of them are the core ovens, and, on the occasion of the writer's visit, the cores for the intermediate cylinder of one of the Canadian Merchant Marine steamers were being placed in the larger one. On the foundry floor was a high-pressure cylinder for the same order, which had just come out of the sand. The men were busy knocking the cores out, and the clean, smooth surface of the casting was very noticeable. For handling the heavy castings and flasks, cores, etc., a Whiting travelling crane of 50,000 lbs. capacity covers the full length of the foundry. To take care of the smaller flasks, there are a number of pneumatic hoists, having long radial arms, upon which a small traveller runs. This gives a good sphere of action, and the whole arm moves up and down to perform the lift after the traveller is brought over the piece to be raised. The main floor is devoted to the larger-sized castings, and the smaller ones are moulded at the sides. To facilitate production, moulding machines are used, most of the smaller castings being moulded on these machines. The cylinders for the small high-speed engines are made on them, and a larger machine is being installed, which will make cylinder castings up to 16 inches diameter. In this connection, it is interesting to know that wooden patterns are used, and it speaks well for the pattern-making department, that some of these patterns have been used upwards of 1,000 times.

Noticeable on the floor was a bed-plate and cylinder casting for a large horizontal compression refrigerating machine. Every thing in connection with the building of engines is cast in this foundry, from fire bars to bed-plates.

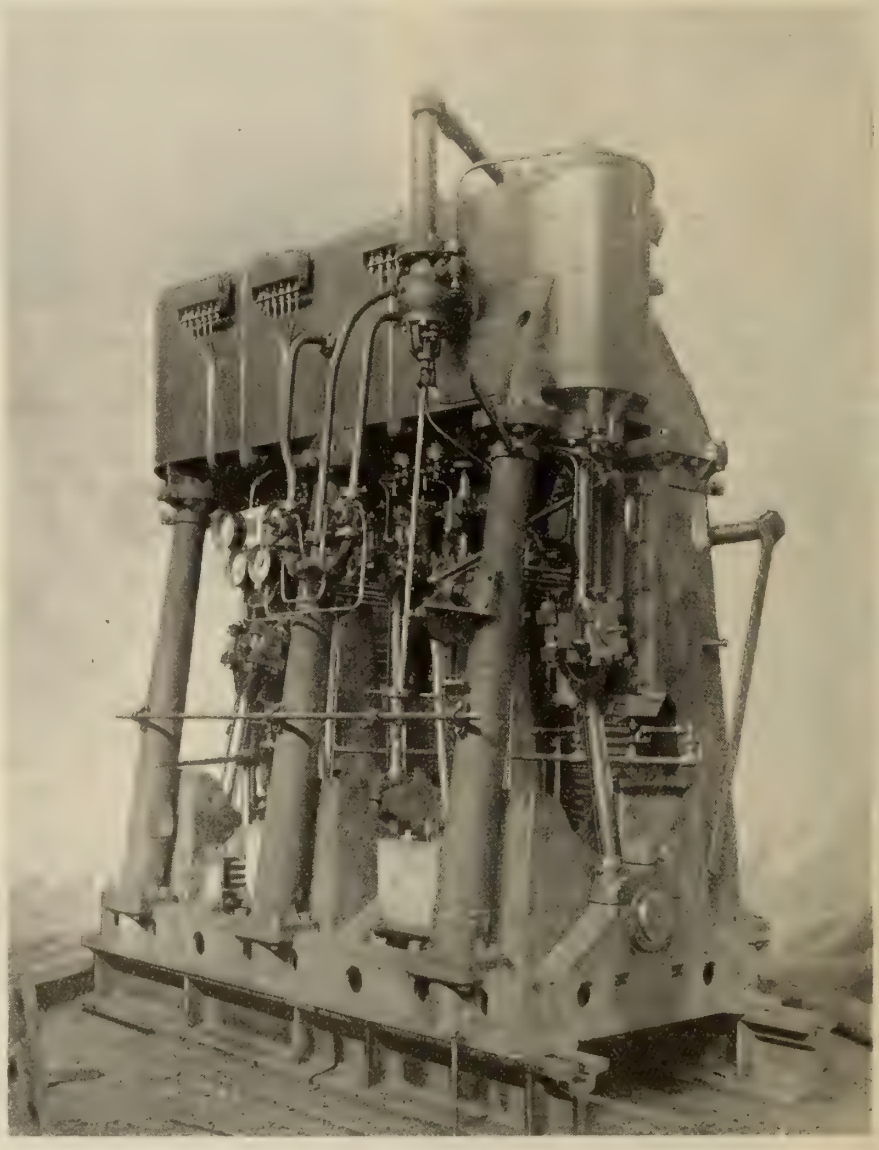
There is also a brass founding department, and here are cast the pump liners, brass bearings, foot and head valves, etc., for the various lines manufactured.

The Large Work

At the front of the building containing the foundry, is the machine and erecting shop, for the large marine work. It is in this shop that, during the building of the trawler and drifter engines, four sets of engines per week, and on two occasions five, were erected, tested, and sent out. Anyone who knows what erecting a marine engine means, will appreciate this performance. The shop presented a very busy appearance, two complete sets of large cylinders being on the floor, or being machined in various stages. On the horizontal boring machine, an intermediate pressure cylinder was being bored out, while, on the large open-sided planer, a high-pressure cylinder was being faced off on feet, etc. An intermediate and low-pressure cylinder were having their valve faces scraped up and faced to the valves, preparatory to being bolted together, and on the floor stood a low and high waiting their turn for machinery. These cylinders are for Canadian Merchant Marine steamers building at Tidewater Shipbuilders, Three Rivers, and Davie Shipyards, Lauzon. In another corner of the shop, a large Contraflo condenser was having the finishing touches administered.

Passing along to the front end of this building, and the short leg of the L, we find the building of safes and vaults being actively prosecuted. This hardly coming into the scope of marine work, we rather regretfully pass on, and ascend the stairs to the second floor. There is more safe work going on up here, but there is also a branch of distinct marine work. This is the making of port hole frames, or side lights, for the living quarters of the Merchant Marine steamers. These ports are made in various sizes, the fit and finish being more like Admiralty requirements than for ordinary cargo-boat work. Above this floor is a third, in one end of which is installed a battery of automatic screw machines. All the bolt and screw work for the output of the plant is performed on these machines, which include Jones & Lamson and Acme makes.

On this floor and the one below, is the stock room, where complete sets of parts for practically every type of machine made are kept. These include connecting rods, pistons, piston rings, valves, eccentric rods, main bearings, eccentric straps and sheaves, for the various sizes of high-speed engines, as well as spare parts for pumps, such as valves and valve seats. Brass packed plug cocks for cylinder drains, etc., are here, and it is especially noticed that these fittings are made on the very best lines. This is one of the keynotes of the firm's policy. Brass fittings, such as drain cocks, etc., are too often made of



TRIPLE EXPANSION ENGINE COMPLETE.

flimsy construction, the plugs being ground fit with a nut and washer to hold them in. This type of cock is always troublesome. The brass cocks fitted to the Goldie-McCulloch product are of the asbestos packed, solid bottom variety, and are of especially strong construction. These are details, but details that bring joy to the operator, and makes him a friend of the firm.

Forge and Planning Department

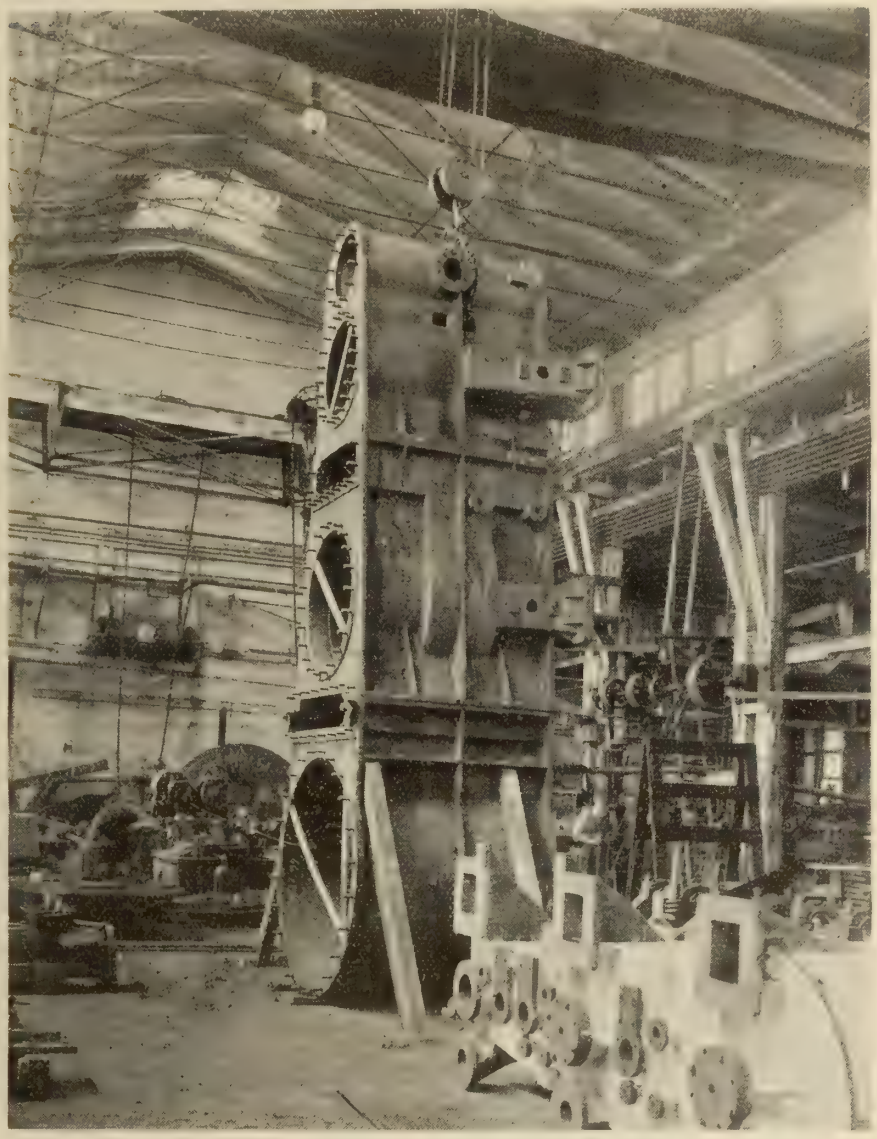
Leaving the building, after having by no means exhausted its interest, one comes to a square building containing the forge, a large wash room, and upstairs the planning department, tool room and tool stores.

The forge is equipped with steam hammers and bolt-heading machine. There is also a large furnace for handling very heavy work, though this was not in use.

In the upper part of this building is the planning department, where each piece that goes into the making of an engine, pump, evaporater, or what not, is routed from the raw material, from operator to operator, till it reaches the shipping room. This department is a most important one, as on the efficiency of routing depends whether the job is completed on time.

On the same floor is contained a very well-equipped tool room and tool store, from whence are issued the various taps, milling cutters, jigs, etc. A set of Johannson gauges are in use to govern the standards.

In the north main building is the general machine shop, and above it the erecting shop for the smaller work, such as small lighting sets, vertical and horizontal feed pumps, and winch condensers. At the eastern end of the shop, on the ground floor, is the pattern shop, and above that is another part of the safe works.



SET OF CYLINDERS STANDING ON END.

The main machine shop is, as would be expected, the place of the general machine tools. Here one can see crank shafts being turned, pistons being machined, piston rods turned, guide shoes planed, and all the various operations being performed that are required to make finished machines from rough forgings.

There is a hydraulic press, similar to those seen in railway shops, for making press fits, such as fly-wheels, crank web, etc. Several lathes, with long beds for turning shafting. Vertical boring machines, double, and in one case, triple-headed, are in evidence. On a slotting machine the keyway is being cut in the fly-wheel of a high-speed engine. All the familiar shapers, planers, millers, etc., are in evidence. Grouped about the machine are parts in the rough, for all kinds of engines, pumps, etc.

Walking up the shop towards the front end, one sees a vertical marine feed-pump set up, with steam and water connections made, and a regular puff coming from the exhaust pipe. This looks interesting, and further examination discloses the fact that the pump is undergoing its steam trials. In connection with the testing of pumps, an elaborate arrangement of tanks and pipes is installed. There are two set of discharge pipe for connecting the centrifugal pumps to, one for the smaller and one for the larger size. The pipes discharge into steel tanks, in the sides of which a three-cornered aperture is cut, making a notched weir, by which the exact quantity of water discharged by the pump can be measured. Every pump made in this shop is tested on these tanks before being shipped.

In the front part of this building, the part contained in the short leg of the L, are built the marine specialties, such as the Morrison evaporator, the Cascade tanks for the Contraflo systems, centrifugal pumps, winch condensers, etc. These are specialties manufactured under license from the English patentees. The Contraflo winch condenser is being almost universally adopted in the British Mercantile Marine, its superiority over the ordinary condenser being such that the weight of the condensing apparatus is reduced by nearly 50 per cent. The Morrison evaporator is well known to all sea-going engineers, one of its features being the ease with which it can be opened up for cleaning when necessary. The Rees Roturbo pump is another specialty which is being more used every day. It is really a turbine pump, not a centrifugal in the ordinary sense of the word. The main difference is that in the ordinary centrifugal pump the impeller imparts velocity only to the water, which is changed into pressure in the diffuser. In the Rees Roturbo pump the impeller is used to create pressure head. The effect of this is to keep power and efficiency constant under varying discharge conditions. We understand that the Cunard Co. have adopted the Rees type of pump for many of their recent vessels built and building in Great Britain.

Small Erecting Work

On the floor above the general machine shop is the small assembling department. There is some machine work

done up here, but generally the space is devoted to erecting the smaller work.

A planer, with five castings bolted on the table, is observed as one mounts the stairs. These castings are the base bearings for the small high speed engines, and are handled in groups of five or six. There are two smaller planers here, and a number of small engine lathes.

The high-speed engines, vertical and horizontal pumps, winch condensers, and Contraflo heaters, each have a certain space allotted to their assembling. Arranged in this space is a rack, which contains every part necessary to the making of the particular piece of machinery being dealt with. Thus, when a high-speed engine casting comes from the machine, and is set on the floor to be assembled, the man engaged on the job goes to the rack alongside of him, and takes from it the crankshaft, bearing brasses, connecting and eccentric rod, piston and rod, valve spindle, etc., till he has the complete machine.

The same thing occurs with the pumps, heaters, or winch condensers. There is the minimum amount of moving about and production is kept constant. All drilling is done on multiple machines, as far as possible, and with jigs, making interchangeability a feature. Condenser tube plates, flanges, etc., lend themselves to this method; for instance, six holes are drilled in six winch condenser tube plates simultaneously, making 36 holes at one drilling. The means employed to screw the condenser tube ferrules into place is also a good illustration. The ferrules are entered in the tube plate just enough to hold by a girl. Following her comes a boy with a small pneumatic or electric drill, which carries a tool made to fit the slot in the ferrule. The ferrules are screwed home in remarkably short time. The remainder of this floor is monopolized by the safe department, the principal feature here being the making of safety deposit boxes.

The Pattern Shop

Going down from the safe department to the ground floor the pattern shop is reached. This is a large and well-equipped shop, and some very fine work is turned out from it.

The patterns for the impellers of the Roturbo pumps present a very good example of the patternmaker's art. In the smaller sizes especially the work is very neat, and requires careful fitting. There are all sorts and conditions of patterns to be seen in here, though just at the time of the writer's visit centrifugal pumps seemed to be in the majority.

There is a large stock of patterns held in a storage building away from the main building, and a new large fireproof pattern store is being erected to take care of the increasing stock.

We have not touched in the North Works in this article, the reason being that it is devoted chiefly to stationary work, lack of space also militates against entering on that phase of the plant.

Mention should be made of the first-aid hospital which is very completely equipped with medical and surgical apparatus, even to an operating table, and in which a trained nurse is always in attendance.

The power house in connection with the main works would make the subject for an article on itself. It is equipped throughout with the firm's own engines and boilers, and a high speed vertical was pointed out that had been running three years, practically day and night, without repair, or even adjustment to any part or bearing, and on a consumption of less than two barrels of oil in the crank case during this period.

We have been enabled to procure some photographs, which are here reproduced, showing some of the marine work done here; but the firm has not neglected its standard land manufactures whilst devoting so much energy to the marine work. In fact, the contrary is the case, and their boiler and machine shops are very busy on normal lines, and a record of their output during the war, added to their marine output, would make an impressive total.

A detailed description of some of the operations would have been of interest, but the purpose of this article was to show in a general way the adaptation of an old industry to a different branch. The results achieved show that the Canadian engineer can hold his own against any competition, and give us great hope of future developments in this field.

STRENGTH OF FURNACES IN VERTICAL BOILERS

John S. Watts

THE regulations for the construction and inspection of boilers, section 63, call for "all furnaces over 42 ins. diameter, to be stayed in accordance with the rule for flat surfaces." In my opinion, formed by a long experience in building, repairing and operating boilers, this rule should be amended; as it compels the fitting of screwed stays where they do more harm than good, for the following reasons.

They tend to prevent the circulation of the water in the already confined water space around the furnace, and retain the scale and feed water deposits on the furnace plate, just where the heat is most intense. This tends to cause overheating of the furnace plate, and defeats the very object for which the stays are fitted.

A furnace without screwed stays will, if weakened by overheating or corrosion, give warning of its dangerous condition by bulging, which will warn even a careless operator that the boiler is in a dangerous condition, in time to take measures to avert the impending collapse.

On the other hand, a furnace fitted with screwed stays, will hold out, without visible signs of distress, until the plate ruptures suddenly, and a disastrous explosion occurs. This danger is accentuated by the fact that it is practically impossible to provide for thorough cleaning of the scale from the furnace shell of a vertical boiler, or to inspect it for corrosion or pitting internally.

The longitudinal expansion of the furnace shell plate is much greater than that of the boiler shell, especially in vertical boilers, the majority of which are not lagged. The screwed stays impede the free expansion of the furnace longitudinally, and the strain thereby imposed upon causes serious grooving of the furnace plate around the stays, this actually weakening the furnace instead of strengthening it, and materially shortening the life of this part of the boiler which is the most expensive part to renew.

In my experience with vertical boilers, I have never yet seen a stayed furnace cut out of a boiler, that was not badly grooved around the stay bolt holes, and generally this grooving or corrosion, reached to such a depth, as to cause one to wonder how the furnace ever held the pressure.

So far as I know, the only argument advanced in favor of the fitting of screwed stays is that we have no exact formulae, for determining the resistance to collapse of a tube under external pressure. The formulae we have, being all empirical, and based upon the results of experiments, which are too few in number to be really authoratitive. Moreover, the problem is complicated by the fact, that no furnace is ever truly circular, and the strength against collapse diminishes rapidly as the tube departs from a truly circular form.

At this point, we may call for a few moments of silent meditation to try and discover how it was that those who devised these rules, and embodied in them regulations covering such minutiae as the size of the rivet heads, could miss so important a point, as it is, to have some fixed tolerance for the departure of the furnace from the truly circular form.

Another, and in my opinion, serious weakness in the rules, is that no limit is placed on the thickness of the furnace plate.

Actual experience shows that no plate in close contact with the fire should be allowed to be more than 5-8 in. thick, and then only when nearly perfect circulation and easy cleaning and inspection can be obtained.

In a vertical boiler, I would prefer to see the maximum thickness placed at ½ in. This because, as is well known, a thick plate in contact with the fire, or very hot gasses, will soon burn or corrode away, until its thickness is ½ in. or ⅝ in., so that it is evidently useless to make the plate any thicker. In fact, it is worse than useless, as corrosion once started is apt to continue.

Now, "revenons a nos moutons": I would suggest that the rule under discussion be amended so as to allow the strength of all sizes of furnaces to be calculated by the formulae given in that rule at section 63, viz.:

$$B = \frac{C \times T^2}{(L + 1)\ D}$$

and that the length of the furnace, L, in

the formulae, be the unsupported length of the furnace, i.e. the length between rows of stays.

Thus, where the desired pressure cannot be obtained by using the maximum allowed thickness of plate (½ in. in vertical boilers, ⅝ in. in horizontal type), one or more rows of stays would be fitted. The length, L, in the formulae, will then become the length from the center of the rivets, in the end seams of the furnace, to the center of the row of stays, or, the distance between the rows of stays, if more than one row is necessary.

This proposed amendment to the rule will demand screwed stays in large furnaces and for high pressures, and it may seem illogical to recommend it, after what I have said above about the grooving caused by their use. But there seems to be no better way available to gain the required strength, and the proposed rule cuts down the ill-effect.

We gain in actual strength from the fact that when stays are required by the new rule, the number to be fitted will be only about one quarter of the number demanded under the old rule. This much smaller number of stays will offer correspondingly less resistance to the circulation of the water, and to the expansion of the furnace, and therefore be less apt to set up grooving. Particulars so at the upper end of the furnace, where the expansion being cumulative from the bottom up, the amount of movement of the furnace relative to the shell is greatest. Because there will then be some two or three rows of stays, now used to stay the upper part of furnace, omitted.

But the main advantage is that, by having only one or two rows of stays, with a space of two or three feet between the rows, the furnace can, if overloaded, give warning of its condition by bulging, which it cannot do if stayed as a flat surface.

As to the safety of this rule, I cannot see why, if the rule now in use is safe for furnaces up to 42 in. diameter, as the regulations claim it is, it should not be safe for all diameters. The formula used is based on Fairbairn's rule, and he placed no limit on its scope.

The Vertical or Horizontal Compressor?

By A. W. SWAN

IT is a curious fact that the trend of air compressor as distinct from low pressure blowing engine's design, has followed entirely different lines in North America and in Great Britain. With the exception of small air compressors for garage work, etc., and one special horizontal and vertical machine, American manufacturers have held to the horizontal design, while the trend in Great Britain is entirely in the opposite direction, and the horizontal compressor is unusual.

The reason behind this difference in design is largely a matter of tradition. England and Scotland have been for years the greatest shipbuilders in the world, and the marine engine has been developed largely by British engineers. The marine triple-expansion engine is invariably vertical. It was natural to keep to this construction for stationary steam engines for power houses, etc., and when the first air compressor came to be built, steam driven, the line of least resistance was followed, and the air compressor was also built with the vertical construction, having the steam and air cylinders in tandem. On this continent the air compressor was developed independently from the steam engine, and while the advantage of the vertical construction were admitted, the horizontal compressor was seen to have its own advantages, and this style was held to. In a large part of Canada and the United States coal is both dear and difficult to procure, and the consequence has been the rapid development of Hydro-Electric power, and the decrease of direct use of steam power except in certain favored regions. One consequence of this has been the rapid development of the electric drive for air compressors, and a still greater separation from the old steam engine traditions. In Great Britain, on the other hand, while coal has risen greatly in price, it is always available—except during strikes—and while electric power supplied from central stations is making great strides, direct steam power is still used very largely. As a result of this, the steam-driven air compressor is still important and as a matter of fact, in the catalogues of some of the British compressor manufacturers the claims of the steam drive are urged quite strongly.

The principal advantage of the vertical type of construction is compactness; no horizontal compressor however arranged, can hope to compete with the vertical machine for minimum space. This feature is important chiefly where space is at a premium, as where a compressor has to be tucked away into a corner of an existing engine room. Another advantage urged for the vertical type of compressor, or at least, one that is put forward by the British manufacturers, is that with the horizontal construction the weight of the piston causes it and the rod to wear oval, with consequent loss of efficiency.

However, extreme compactness is not always the controlling factor in a compressor installation, particularly if the compactness carries with it some disadvantages, and if the vertical construction has such manifold advantages it is surprising that the Ingersoll-Rand, Chicago Pneumatic, Sullivan (except in their twin-angle machine) have held so tenaciously to the horizontal type of construction. The fact is, that horizontal construction of air compressors carries with it the great advantage of accessibility, which is often at least as important as extreme compactness. A well-built compressor will run steadily for months without even inspection, but even the best of machines is none the worse for an occasional run over, and if a compressor is built so that inspection is easy it is much more likely to have attention than one which is difficult of access. Even with the best systems of splash or forced lubrication, including strainers, etc., the oil should be cleaned out every now and again and sent to the filter; in fact, accessibility is a highly important and necessary feature in an air compressor. And the horizontal machine is certainly easy of access for inspection. The crank chamber can be inspected by lifting off a cover in some makes, cross-head and guides are similarly get-at-able. The cylinder is also easily accessible without having to climb a ladder to get at the cylinder head, and this applies particularly to the steam-driven compressor. Then as to the piston wearing oval, there seems to be another case where the theory sounds better than the actual facts; at least there are hundreds of large and heavy air compressors all over Canada and the United States, all of horizontal construction, and it certainly is not a common complaint to hear of pistons and rods wearing oval, and giving trouble in this way.

When all other considerations have been weighed, there remains one important advantage of the direct-connected horizontal air compressor—fewer bearings. The rotor of the motor for the direct-driven horizontal type of compressor is wound on the main driving shaft, and there are only two bearings. In the vertical machine the motor is at one end of the compressor, with the flywheel between compressor and motor. The motor has its own two bearings, there is another bearing between flywheel and compressor, and two more bearings in the compressor itself. The whole unit is mounted on one base, and as the four bearings are bored at one setting, there will be no difficulty about securing correct alignment for the initial set-up. But maintaining correct alignment when the bearings begin to wear is another story. So that while the vertical direct-connected machine is satisfactory if properly erected, and if the foundation is absolutely stable, the direct-connected horizontal machine is easier to erect, and keep in alignment.

THE WHITE DIESEL OIL ENGINE

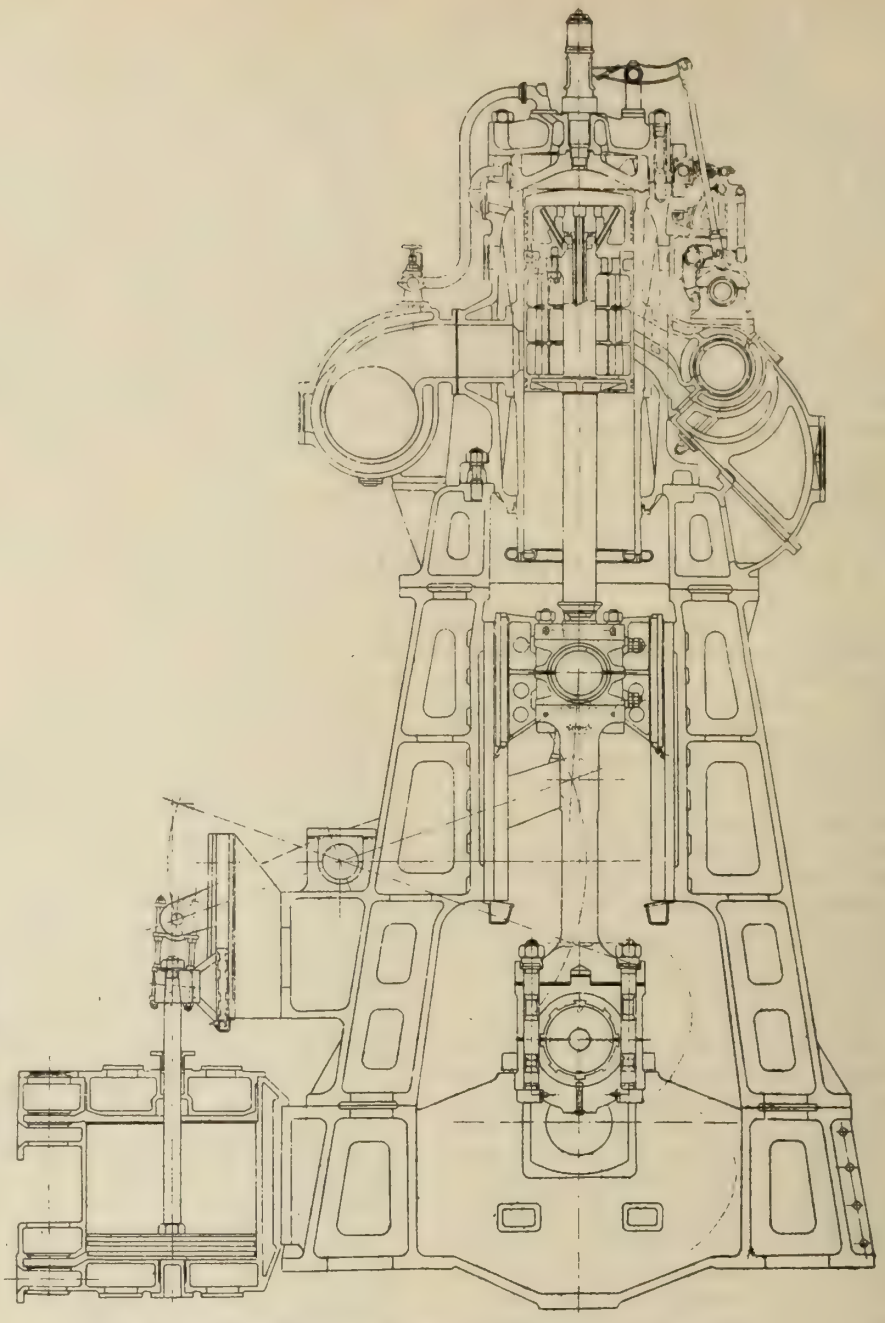
The old established firm of J. Samuel White & Co., East Cowes, I. of W., Eng., are manufacturing a two-cycle type of Diesel oil engine for marine and stationary purposes. The marine type is made both for the mercantile marine and naval uses, these engines having been installed in some of the British submarines. They are built to operate on any kind of commercial fuel oil. They are made in two distinct types, one of them being a heavy, slow-running engine for marine and power plant purposes, the second type being lighter and fast running for special services such as submarine work. The sizes made are from 150 B.H.P. to 2,000 B.H.P.

The marine engines are made directly reversible, the operation consuming only a few seconds. For slow-running and cruising speeds the full speed revolutions can be reduced by one-third. One feature of the design is their ready accessibility, a most important feature in a marine engine. The engines being built on the two-cycle principle, a uniform turning movement is obtained, and with the six or eight-cylinder marine engines, no flywheel is fitted. For convenience in fitting spare parts, the engines are manufactured on an interchangeable method, the "Newall" system of gauge limits being used throughout. Regularity of firing at all speeds, with economical use of injection air, speed control and flexibility, are features of the machine. Forced lubrication is used throughout, and the piston is cooled by this means. In the larger sized engines a separate arrangement for the piston-cooling oil is furnished, distinct from the general lubricating system. The outside working parts are self-lubricated, and require nothing more than the periodical filling of the boxes.

The pistons for engines up to 1,000 B.H.P. are of the stepped piston type, the heads of the power pistons being removable. The scavenge piston is part of the main piston, this arrangement having two good points. It removes the crosshead pin from the hottest part of the cylinder, and at the same time forms a guide for the crosshead. In the larger marine sets up to 2,000 B.H.P. the engines are of the open crosshead guide type, and the scavenge pumps are driven by links and levers as in the steam reciprocating type.

The cylinder heads are separate castings, arranged to carry the fuel valve, scavenge valves, starting and relief valves, with their respective cams and air starting gear. The valves are arranged so that any valve and its operating lever can be removed for inspection without interfering with any adjacent gear. The air compressors are arranged at the forward end of the shaft, and valves and air coolers are of special design. The weight of the heavy type of engine is about 215 pounds per brake horse power, while that of the submarine type runs as low as 61 pounds in some cases, the highest being about 140 pounds.

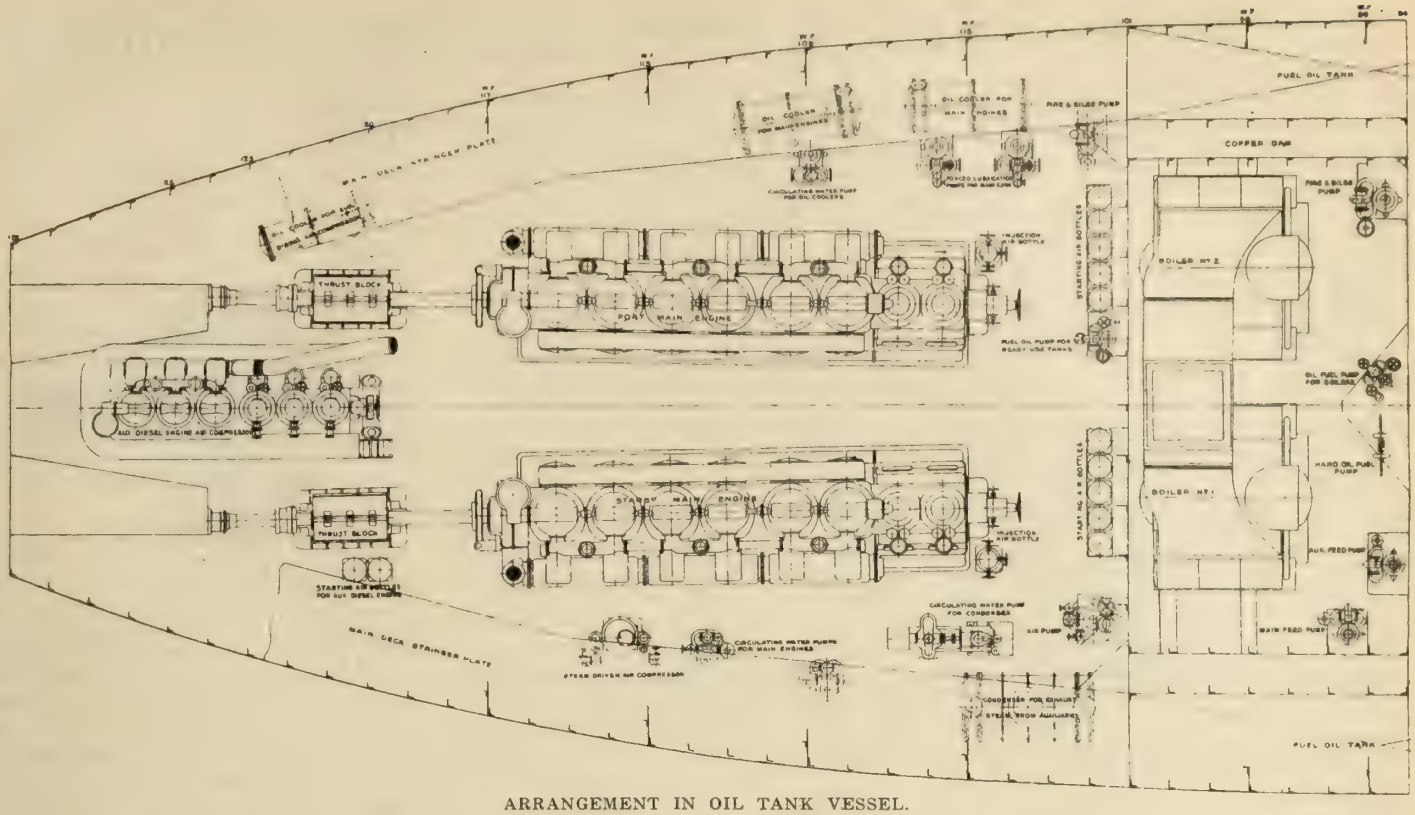
The two-cycle type of Diesel engine is claimed to have the following points of advantage over the four-cycle type: They are capable of developing greater power with the same number of cylinders and the same revolutions, due to receiving a power impulse every revolution, instead of every two revolutions. The extra power is from 1.75 to 1.9 times that of the four-cycle type. At the same time the weight is only about 65 per cent. of the four-cycle engine. The turning moment is much more uniform, and where flywheels are fitted, they can be built much lighter. They are handier for reversing, the four-cylinder engine being able to start from any crank position. The compression on every upstroke balances the inertia of the moving parts. The bolts of connecting rod ends and main bearings can be made lighter on this account, the alternate compressive and tensile stresses met within the four-cycle type being absent. Fuel consumption is lower for the same power.



CROSS-SECTION THROUGH 1500 H.P. 2-CYCLE DIESEL ENGINE.

The accompanying illustrations give a good idea of the general features and arrangements of the engines. The firm have issued a very handsomely bound catalogue, well illustrated and full of information, which will be of great use to any prospective user of this type of prime mover.

Messrs. J. Samuel White & Co. enjoy the distinction of being the oldest shipyard on the Admiralty list. Besides the oil engines described here, they build ships, steam engines and turbines, Scotch and water-tube boilers. Their latest addition to the navy was H.M.S. Witherington, of 28,500 S.H.P., and a speed of 35 knots She was fitted with the White-Forster water-tube boilers, and oil firing. She is the 71st torpedo boat constructed by the firm.



ARRANGEMENT IN OIL TANK VESSEL.

THE LATE SIR NATHANIEL DUNLOP.*

IN Sir Nathaniel Dunlop there has passed away one of the greatest of the men who built up the British Mercentaile Marine, and made it the great power in the world which it was before the war, and which, we all hope, it will very soon again become. When Sir Nathaniel Dunlop retired in 1909 from the chairmanship of the Allan Line, British shipping as predominant all over the world, and not least on the North Atlantic. The war has given the shipping of America an opportunity of which it has not been slow to take advantage, but even now the maritime position of this country is such that we may look upon it with not a little pride, and pay a tribute of respect and admiration to the men who created and developed our shiping services. Among these there were few more outstanding than Sir Nathaniel Dunlop. He was a Clyde man from first to last, a native of the area, trained in Glasgow, and with all his business instincts and interests concentrated in the work of the Allan Line and the success of the port of Glasgow. But he was anything but parochial in his outlook. He built up the Allan Line on a broad foundation because he had a profound belief in the future of British overseas trade, and he never ceased planning its development because he believed in the future of Canada. In one sense it may be said that Canada made the Allan Line, but in another it may be said that the Allan Line made Canada. For, long before the European world had realised that the possibilities of Canada were iilimitable, the Allan Line had discovered the Dominion and were providing it with mail services and with the latest types of vessels to carry on its trade with the United Kingdom. For generations the Allan Line steamers did practically all this work, and for about three-quarters of a century Sir Nathaniel Dunlop served the company—from clerk to chairman; right up the latter, rung by rung. It was a wonderful career, perhaps one of the most wonderful in the annals of British shipping. How many people knew last week that there was one man still living who had shared in the work of running the 400 to 700 ton sailing ships, then known as "Quebecers," which carried on the service between thhis country and Canada from 70 to 80 years ago; who could talk most interestingly of the days when two round voyages per annum were good business, and three extraordinarily good, and when there was a "Spring" and a "Fall" trade to the Canadian ports? Or how many realised that there was one man who had been in close touch with the evoltuion of shipping services, from the days of the sailers, right through those of the early iron steamers; the introduction of steel; the supersession of the paddle by the screw on ocean routes; and the coming of the turbine? Not only did Sir Nathaniel Dunlop live through all these stages in the evolution of ocean transport: he was one of the most active of workers, and one of the most potent of factors in the process; and his life's story, the story of the Allan Line, and the story of the development of Canada, might almost be written as one book. He was one of the great personalities of British shipping, and when he resigned the chairmanship of the Allan Line in 1909 it was the closing of one era and the opening of another. There is now, strictly speaking, no Allan Line, but the Canadian Pacific Ocean Services, Limited, are built on foundations which the Allan Line made secure, and Sir Nathaniel Dunlop, more than any other man, made the Allan Line what it was in 1909, one of the finest and most progressive shipping companies in the world. But he was more a shipowner. As a member, and for a number of years the chairman, of the Clyde Navigation Trustees, Sir Nathaniel served Glasgow and the Clyde well, and to him there should be credited much of the prosperity of the river and port. He knew intimately all the routes and ports on and to which his ships sailed; he had busines interests in Liverpool, Quebec, Montreal, and many other places, but the Clyde was his first and life-long attachment, and nothing in the way of improvement in docks or waterway was too good for its shipping. He was a remarkable blend of world-wide business interests and intense local sympathies: of strong individual character and the capacity for working cordially in harness with others. There do not seem to be many men of the type nowadays, but perhaps we live too near those who are, and do not see them in proper perspective. At any rate, Sir Nathaniel Dunlop was really one of the dominating figures of his generation, and his autobiography would have been one of the most valuable and interesting contributions that could have been made to the history of shipping. *Syren and Shipping.

The Principles of a New Centrifugal Pump

The Rees-Ro-Turbo Type of Pump is Herein Described, and Various Illustrations Are Given of Interesting Portions of This Class of Pump

By J. H. MOORE

BEFORE going into the construction of this type of pump, let us go back quite a few years, and see where first the idea of centrifugal pumps appeared.

Something over two hundred years ago the centrifugal pump was invented by Demesne Papin in Hess, Germany. Little seems to have been done with it in a practical way for a long period. It first appeared in this country in 1818, and was known as the Massachusetts Pump. Gradual improvements were made in its design by Andrews in 1839, Bessemer in 1845, Appolod in 1848, and Gwyne in 1851. The development was slow and until within the last ten years was not considered seriously by many engineers, except for large capacities and for extremely low heads.

No doubt the delayed development was largely due to the fact that to get the best results from a centrifugal pump, impellers should be of small diameter running at high speed, but until the advent of the electric motor and steam turbine there was no means of driving centrifugal pumps at the necessary speed except through belting of gearing with their inseparable difficulties and losses in transmission, which neutralized the advantages aimed at in the pumps. With the introduction of electric motors and steam turbines high efficiencies became possible, and for high lifts the old arrangement of impellers in series was revised and the centrifugal pump became a strong competitor of the plunger pump for conditions which used to be looked upon as only suitable for reciprocating pumps.

Perhaps the defect which has been the most difficult to overcome and which has decided the buyer in many cases against this type of pump, has been the fact that it would work at its best only at the exact head for which it was designed, the reason for this being that the blades of the impeller were shaped so as to pass a certain amount of water with the minimum frictional loss, due to cavitation; but if the head against which the centrifugal pump is working reduces, a greatly increased volume of water passes and the impeller then becomes unsuitable for the increased speed of the water through it and begins to act as a water brake, thus creating an overload on the driving machine.

These conditions were well-known and until the introduction of RoTURBo by Rees of Wolverhampton, England, in 1907, it was attempted to overcome them by designing the impeller with blades bent rearwards so as to reduce the break effect. This necessitated increase in the speed of the impeller to compensate for the slip of the water, and beyond a certain amount of recurvature the capacity of the pump is very greatly reduced and the internal friction of the impeller increased with consequent loss of head at anything but a restricted range of service.

True, turbine pumps are of such comparatively recent development that the general public and, in fact, many engineers have not been sufficiently well informed upon the subject to distinguish between a high grade turbine pump and an ordinary commercial centrifugal pump.

Venturi Pipe

What is know as the Venturi principle is embodied in a specially shaped contraction in a water pipe having an abrupt nozzle where the water enters the construction, and a gradually expanding taper piece after the water has passed the contraction. The result of this is that the water under pressure in the pipe is forced through the neck at a high speed, and in doing so it loses its pressure, in the inverse ratio to which it gains velocity, so much so that the whole pressure can be annulled in the neck if the contraction is sufficient and an actual vacuum can be created. When the water enters the expanding pipe the speed of the same is slowed down again, due to the increasing diameter, and as the speed is lost the water regains its pressure. The Venturi pipe, therefore, is a hydraulic transformer, with a double transformation, converting from pressure into velocity and the velocity back again into pressure, and without much loss.

The special shape of the Venturi pipe is because a very abrupt contraction will convert pressure into velocity, but a carefully designed expanding piece of about 10 or 12 degrees expansion is necessary to attain the second conversion, because if the expansion is abrupt the water leaves the sides and the head (instead of being regained) is lost in friction and eddies.

In the ordinary centrifugal pump with an open rim impeller, the object is to pick up the water in the eye of the pump and get up a high peripheral velocity as of the water as it leaves the impeller and convert this velocity into pressure in the expanding channels of the pump casing; a very difficult and inefficient conversion.

These expanding channels are the exact counterpart of the expanding part of a Venturi transformer, but the contracting part of the Venturi transformer was not previously used in centrifugal pumps until what is known as the Rees RoTURBo Pressure Drum replaced the ordinary impeller. The pressure drum is a water chamber of large capacity, in which, by centrifugal force, a pressure is accumulated; the water being flung against the rim by the revolution of the drum and generating a hydraulic pressure inside of the drum. The water is allowed to escape through abruptly contracted openings in the rim, precisely in the same manner as the contracting part of the Venturi pipe.

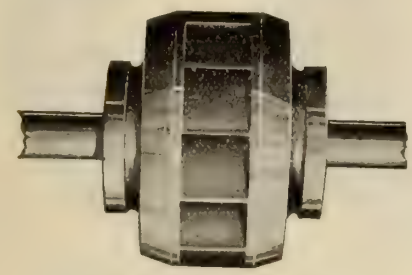
These openings, or nozzles, are pointed backward, and as the water escapes from them the jets of water have a turbine effect and give self regulation or a reduction of power when the head is reduced and a larger volume than the normal passes through the pump. The contraction of the openings is such that only 25% of the initial pressure is converted into velocity. That is to say, the water going through the nozzles at normal duty has a pressure of 75 per cent. and a velocity equivalent to 25 per cent. only. This velocity is picked up again in the expanding channels of the pump casing, so as to make the total pressure of the water being delivered from the pump equal to the 100% originally intended, but by this arrangement only 25% of the head is picked up in the expanding part, instead of the 100% as in the ordinary pump. As the expanding part of the Venturi transformer is the most difficult to design, and the efficiency of the same depends entirely upon the accurateness with which this part is designed, it will readily be seen why a pump of this type leads in the matter of efficiency.

General Principles

The design of the pump is exceedingly simple, comprising a single or a series of pressure drums (the number depending on the nature of its work), rotating inside a cast-iron casing at a moderately high speed. These revolving pressure drums are mounted on a central shaft supported in bearings. There are no moving parts in contact, except at the bearings, and the whole of the internal arrangements are such that the pump is in hydraulic balance and free from any lateral end pressure on the shaft. The main bearings are external and oil ring lubricated, and packing arrangements are exceedingly simple.

When running the water gravitates or is drawn into the eye of a revolving pressure drum where its speed is slow relative thereto, the water being carried round by the revolving partitions. A pressure is created in the revolving drum by centrifugal action of rotation, and the capacity of the chamber being large the water slowly moves towards the periphery, where there are a number of short nozzles curved in a direction op-

posite to the direction of rotation. These nozzles convert a portion of the pressure into velocity, and the water passing through them behaves as in a turbine, assisting the rotation of the revolving drum, thereby giving a self-regulating effect. The escaped water still having velocity in the direction of rotation, is passed between stationary diffusion channels which convert the remaining velocity into pressure. A considerable



SINGLE-STAGE IMPELLER.

space is left between the revolving nozzles and the stationary channels, greatly minimizing the effect of any wear and tear.

Impeller

The special feature of the pump, which (instead of being built as a flat disc runner with the main object of securing velocity of water in the expanding channels of the fixed casing), is designed in the form of a barrel or pressure chamber, the object aimed at being to secure a constant pressure inside the revolving drum or impeller, equivalent to the height of the lift. The impeller having this large capacity, the water inside as it approaches the rim becomes practically stationary relatively to the impeller, thus eliminating frictional losses and generating a pressure by centrifugal force.

Another interesting feature to note is that the highest efficiency point is when the speed of the water issuing from the impeller in a rearward direction is 50 per cent. of the peripheral speed of the impeller and this for the same reason that the Pelton wheel gives the highest efficiency when the speed of the buckets is half the speed of the water jet. In fact, the pump may be looked upon broadly as a reversed Pelton wheel in which the buckets are stationary and a series of nozzles on the rim of the impeller revolve, whilst the ordinary turbine pump with the narrow disc impeller is, of course the reversed vortex turbine.

The Effect of Self-Regulation

The self-regulating pressure chamber is the equivalent to a pump and a turbine in series, the result being that if the head varies or is reduced below the head for which the pump is designed, there is no overload possible, the turbine rim blades extracting the energy of the increased speed of the water through the impeller, which otherwise would be thrown to waste. It follows, therefore, that the margin of horse power usually allowed on the motor in the ordinary turbine pump for this emergency is unnecessary, it being absolutely impossible for the pump to overload materially the motive power so long as the speed is kept constant, regardless of the head against which the pump is working, or as in the extreme case of a pipe bursting, taking the head off the pump entirely. The value of this feature of the pump in keeping down power costs to the lowest point without the necessity of complicated arrangements for speed variation or cutting out impellers, will at once appeal to the manager or engineer.

With further reference to self-regulation and the turbine effect, it should be noted that the impeller becomes a pump and a turbine in series, with a pressure chamber between the two portions. The pump portion is, therefore, always discharging into a constant pressure, which is the ideal condition for a centrifugal pump, and the turbine is always discharging from a constant pressure, which is the ideal condition for a turbine.

The result of the combination just described is perfect self-regulation with the highest efficiency and, at any head lower than the normal duty, the power taken by the motor is prevented from rising.

Characteristics

When running under a constant speed the Rees RoTURBo Pumps are designed to deliver a certain capacity against a specified head at this speed, and will give a guaranteed efficiency at that point. If required to deliver water at a higher head (and all the following calculations are based on a constant speed), the pump will deliver against this higher head up to 115% of the designed head. The amount of water delivered will decrease as the head increases above the designed head, and the efficiency will also decrease likewise.

For instance: At 106% of the designed head the pump will deliver 83% of its capacity, and the efficiency will be 95% of its guaranteed efficiency. In a similar manner: At 108% head, delivery is 73%, efficiency 90%. At 111% head, delivery is 60%, efficiency 80%. At heads above, the capacity and efficiency are not dependable, and the characteristic curves for the pump in question will have to be referred to.

For heads lower than the designed duty, the pump is more stable. For instance: for heads from 100% of the designed head down to 82% designed head, the pump will give an efficiency of 100% of that guaranteed, and the capacity at 82% is 126% of the designed.

At 69% head, the capacity is 140% and the efficiency 93%.

At 65% head, the capacity is 145% and efficiency 90%.

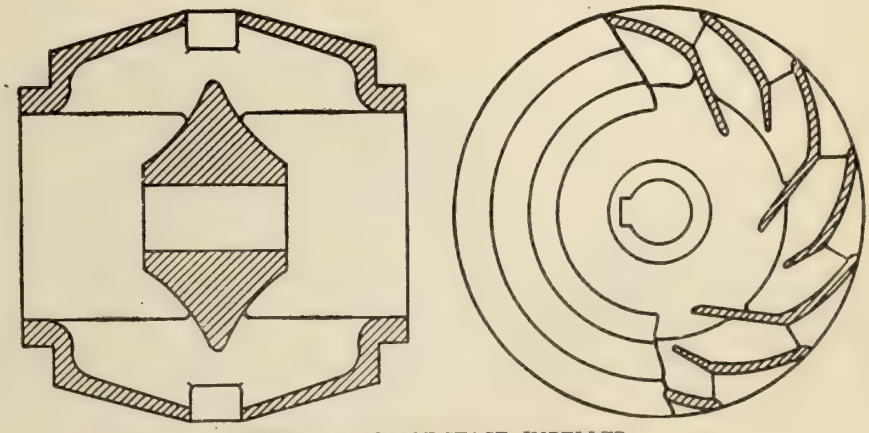
At 52% head, the capacity is 155% and efficiency 80%, etc., down to open valve or no head, at which point the pump will deliver in the neighborhood of 192% of the designed duty.

Due to this flat head and volume curve the efficiency of the pump is flat and varies over a wide range.

From the figures given you will note that it is best that the pump operate at heads lower than that for which it is designed. In fact, never, under any circcmstances, would it be advisable for pump to operate under conditions where the head will be higher than that for which it was designed.

It will be noticed that the efficiency of the pump remains at the highest point until the head is reduced as low as 82% of the designed head and the capacity has increased to 125%. The pump can operate very satisfactorily down to heads as low as 40% of the designed head, and at this point the efficiency will be 60% of that guarantee, and the capacity will be approximately 160% of that for which it was designed.

A fact which should be remembered is that the volume increases directly as the speed; i.e., if the speed is doubled the volume will be doubled, and at the same time the head will vary directly as the square of the speed, and the head will be quadrupled, and likewise the power will be increased in direct proportion as the curve of the speed, or as the speed doubles the power will increase as the cube of 2 or 8.



SECTION OF SINGLE-STAGE IMPELLER.

Prof. Zowski's Report on Rees RoTURBo Pumps

The following technical report of Prof. Zowski, of the University of Michigan, sets forth clearly the principles in-

volved in the RoTURBo Pump, and will be found of interest. The accompanying curves and test cards should be of assistance in discussing the subject with consulting engineers and others.



SINGLE-STAGE DIFFUSER.

The new hydraulic principle embodied in this pump is that the impeller is used to create pressure head directly, whereas in all other centrifugal pumps the impeller imparts to the water practically speed energy only, leaving it to the diffusor to turn this speed energy into pressure head, which is always a very inefficient transformation.

A chamber of relatively large volume makes up the major part of this casing. A great volume of water is dragging along, and being exposed to the centrifugal force created by rotation is converted into a sort of accumulator which feeds the discharge nozzles and is itself fed by the suction pipe.

The speed of flow in the chamber is very small and its effect upon the pressure head which is caused by rotation is, therefore, very slight. Consequently, we may vary the discharge considerably without changing the pressure conditions in the impeller to any material extent. The variations in the discharge will only change the pressure at the entrance into the diffusor, and this produces the varying pressure differences which are, of course, necessary, if different quantities of water are to pass through the same passage area.

The fact that the speed of flow in the impeller is very small, means also that the theoretical power of the pump is practically dependent only on the pressure head created in the chamber, and therefore, equally independent of the discharge as the same.

If we now succeed in designing a pump in which also the efficiency will be independent of the discharge, then it is self-evident that the variations in the discharge will not affect much the actual power which is required to drive the pump. In this pump this condition is fulfilled for the following reasons:

1st. Because the speed of flow is very small, the hydraulic loss of the impeller will be very slight as compared with the other hydraulic losses of the whole pump, and changes of speed flow caused by varying the discharge can, therefore, not affect much the total efficiency.

2nd. The impeller nozzles act as turbine buckets, doing useful mechanical work by deviating the discharging water streams, and thus creating the S.C. force of reaction pressing against the buckets in the direction of rotation. This mechanical work increases with increasing discharge, and therefore, neutralizes to some extent the increase of hydraulic losses which takes place when the quantity discharged is increasing.

On the basis of what has been stated above, the following characteristics may, theoretically, be expected from the Rees Pump:

1st. A flat power curve with varying discharge.

2nd. A flat efficiency curve with varying discharge.

3rd. A total efficiency which must be at least as good as that of any other centrifugal pump, and which, on account of the relatively small velocities which flow through the impeller chamber, may be expected to be even better, if both are designed and built with the same amount of care and precision.

It cannot be the purpose of this report to enumerate the various instances in which this pump may be used to a greater advantage than the other centrifugal pumps, but this seems to be quite certain that the pump is ideally fitted to all services where the operation conditions are variable. Further, the peculiar construction of the impeller makes it relatively easy to use the pump as a wet compressor or as a vacuum pump, as it is a simple matter to admit the air or exhaust steam into the wide impeller chamber, and then to compress or mix it with the water in the impeller.

S. J. ZOWSKI.

On all pumps the casing is split horizontally so that the pump can be opened out and the internal parts examined by simply removing the top half of the casing.

It is very advisable to have both the branches, that is to say, the suction and discharge openings, in the bottom half of the casing, so that the top half can be removed without disturbing the branch connections. The standard arrangement is with both the suction and discharge branches horizontal and below the centre line of the pump. The suction branch can be made vertical if specially required. The horizontal suction branch is, however, preferred. The standard arrangement is with the discharge branch on the right hand side looking on the thrust end of the pump, but it is equally satisfactory to have it on the left hand side.

This pump may be made with either one or two main bearings. When the prime mover is supplied by another firm our practice is to fit two main bearings in all cases, but when the prime mover is supplied by ourselves, one main bearing is sufficient in the case of reciprocating engine drive and on small units with turbine drives up to moderate speeds; but in the case of high speed turbine drives (above 2200 R.P.M.) or units absorbing more than 50 H.P., two bearings should be supplied. With two main bearings a flexible coupling is used, but with only one main bearing a solid coupling is required. A brief description of the various types is given below:

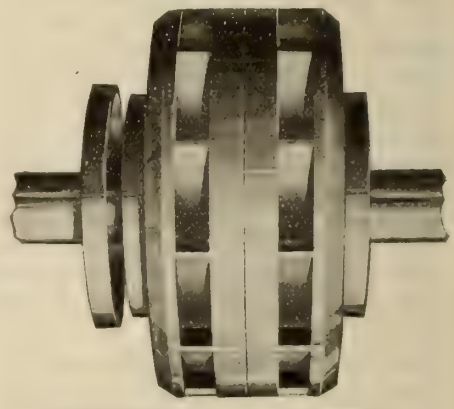


MULTI-STAGE DIFFUSER.

C. W. Type

These pumps may be used for heads up to 120 feet, when the impeller is made of cast iron; double that head when it is made of bronze. It is not usually good practice to exceed 180 feet on a single-stage C. W. pump, unless it is of considerable capacity. Lubrication is by one or two oil rings, running over the shaft and dipping into a large reservoir beneath. This bracket also contains a two way ball thrust bearing, which acts as a centreing block for the impeller, keeping the nozzles in line with the diverging channel. In special cases the branches may be located at almost any position on the periphery of the casing to suit the convenience of the customer; but this should be avoided whenever possible, as it means special attention in designing and will probably entail delays in shipment.

The base plate is of cast iron, usually in one piece of the heavy boxed ribbed



MULTI-STAGE B TYPE IMPELLER.

type, extended to receive the driver. For belt drive, two pedestal bearings are furnished, thus providing a bearing on each side of the pulley. Lubrication is by ring oiling. The efficiency of this pump will range from approximately 40% on a very small pump to 80% on a large one, depending entirely on the fitness of the pump in question to the

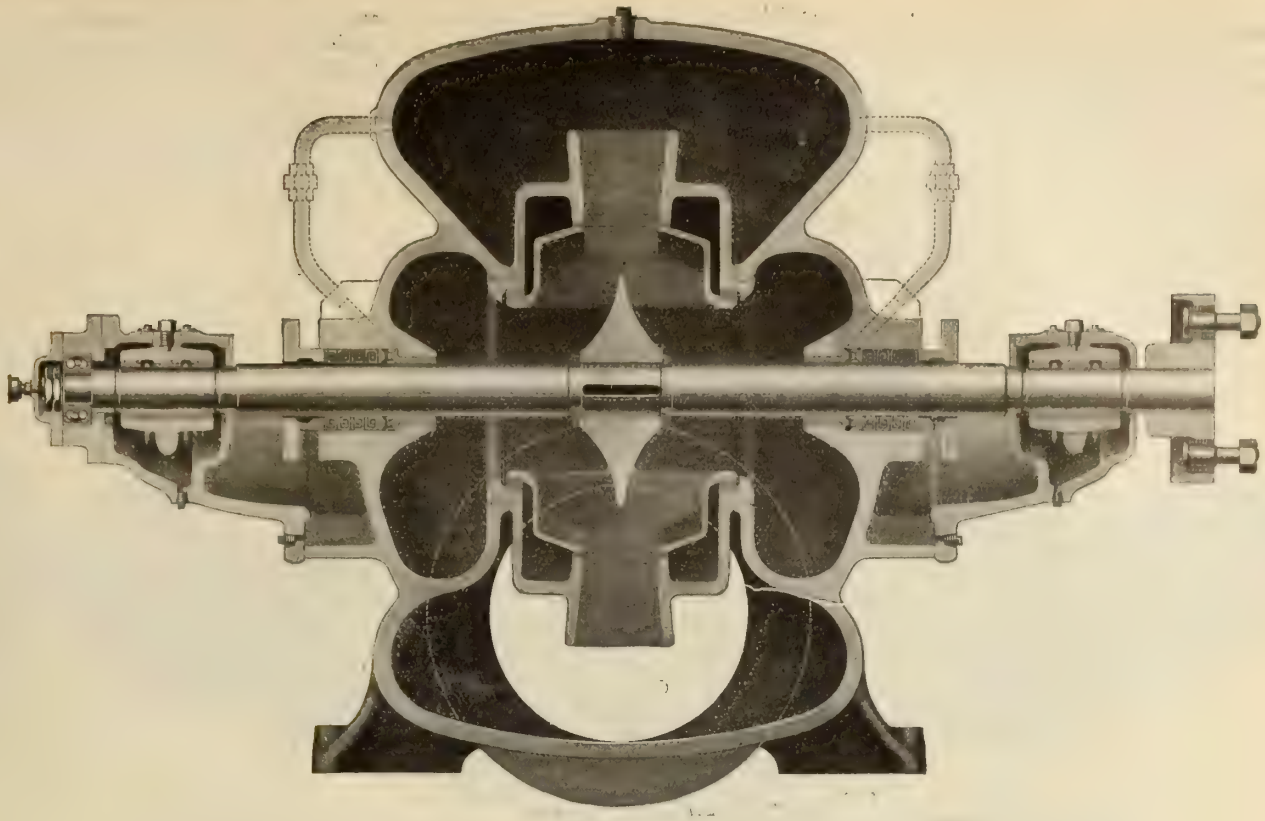


FIG. 1.—C. W. TYPE SINGLE-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

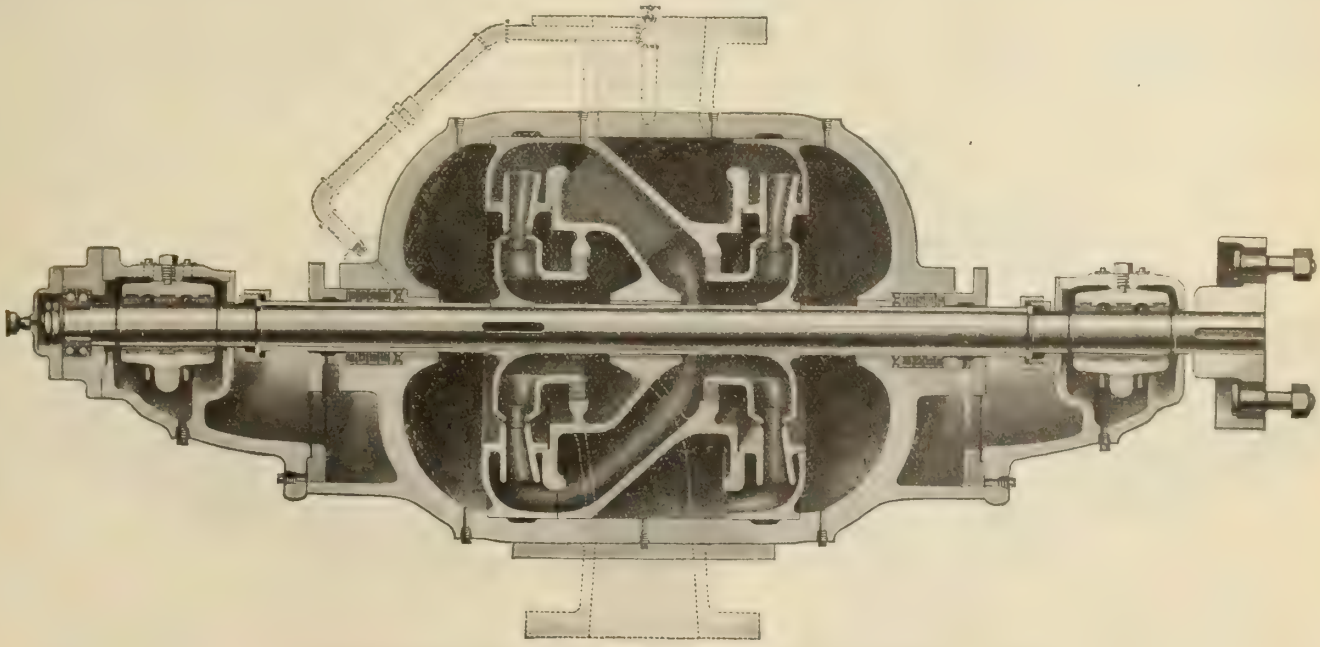
service demanded of it. Efficiencies obtainable are found for any given conditions from the efficiency charts. In practice the best efficiencies are obtained with heads varying from 40 to 140 feet.

S-2 Pump

This consists of two single stage, single impeller, single suction pumps, mounted on one shaft, and placed in one casing; in reality, this is two single stage pumps in one casing. The impeller differs from that employed in the C.W. Pump in that the water enters on one side or through one eye only, and therefore the capacity of an equivalent size S-2 impeller is only one-half that of a C.W. type of pump of the same diameter, the capacity limit of the impeller being based on the velocity of water through the eye. The impellers in these pumps, when mounted on the shaft face to face, are so arranged that water under pressure flows to the back of them, thus hydraulically balancing them with regard to end pressure. The diffusors of these pumps are two in number, and are of the straight way type similar internally to those used on the C.W Pump. What has already been said about number and type of bearings for previous pump, is also applicable to the S-2 Pump.

B Type Pump

This type of pump is one which is particularly well adapted for exacting service. It has many advantages over the ordinary centrifugal pump besides the special feature of the capacity chambers. It is multi-stage built in multiples of four, and not otherwise. The impeller is of the two stage type, each impeller having two stages back to back with an eye on both sides. This is a mechanical advantage in that it shortens the length

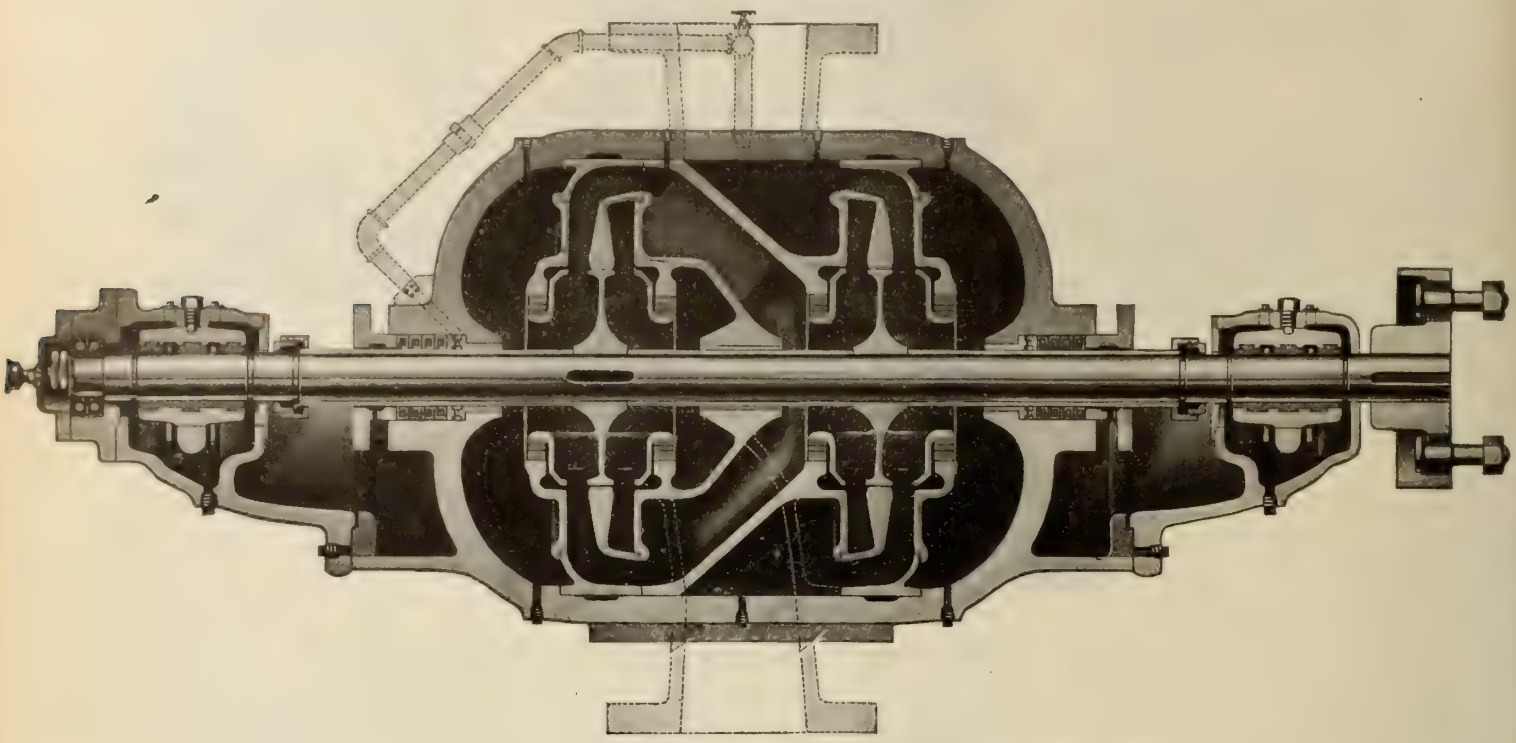


S2.—TWO-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

of the pump, and consequently the distance between bearings. The arrangement of the stages in multiples of four only, is clearly explained by reference to the method of obtaining hydraulic balance. This hydraulic balance is

These diffusors are two combined in one, and cross the water from one stage of the pump to the next, and in this way (the water being crossed in a correct manner from one stage to the next) the pump is balanced with reference to end

and for which an extra charge will be made. B type pumps are used for heads from 100 to 1,600 feet. Their efficiencies are found from the efficiency charts. Given the volume and head per stage on the pump the best efficiencies are ob-



B2.—MULTI-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW.

not only theoretically perfect but is actually so. This can easily be proven by the fact that on pumps up to 16 stages and more, a standard type of ball thrust bearing is used for the centreing block instead of the usual type of collar, water cooled marine thrust bearing, used by other pump manufacturers to take up end thrust. The end thrust experienced in RoTURBo Pumps is practically negligible. The purpose of the ball thrust used is to keep the impeller in line with the diffusors. The compactness of the pumps is further facilitated by the use of cross over diffusors.

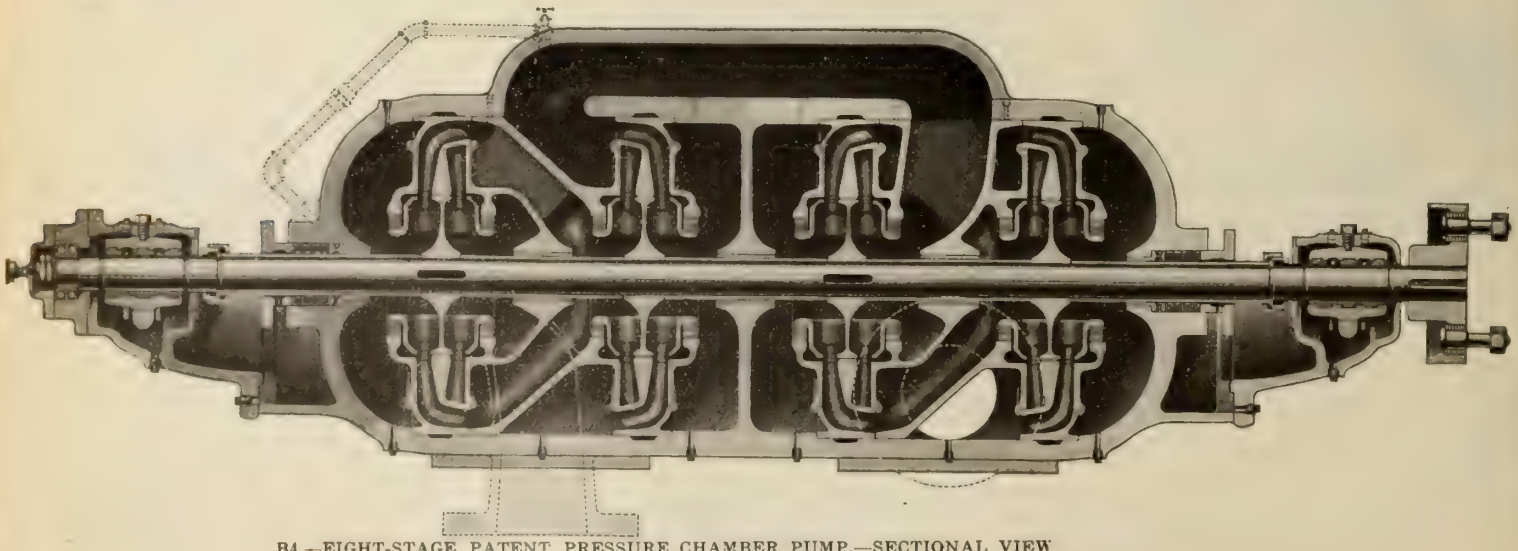
pressure. B types of pumps usually contain two bearings, both external to the casing, supported in brackets from each end of the pump. These are the same as those used in the other pumps, and are lubricated by means of two rings to each bearing dipping into a large reservoir of oil beneath, which has an overflow and drain. Above each stage of a B type pump is a relief or pet cock, its purpose being to relieve the entrapped air. B & S types of pumps have bronze covered shaft; the other type of pumps have steel shaft unless bronze is specified, which will be special

tained with heads of from 40 to 140 feet per stage.

The makers of these pumps claim the following features and advantages derived from their pumps, namely that:

1. A drooping power curve, i.e., a power curve which rises not more than 10% as the volume is increased beyond the designed duty point and falls away as the volume is still further increased, thus making it impossible to impose an overload on the motor or turbine which may be used for drive.

2. High and permanent efficiency maintained over a very wide range of



B4.—EIGHT-STAGE PATENT PRESSURE CHAMBER PUMP.—SECTIONAL VIEW

heads and volumes, i.e., a flat efficiency curve.

3. A head and volume curve which goes out to approximately 200% of the volume at the designed duty point when delivering against no head, in other words, maximum increase in volume at reduced heads. This is a great advantage for many purposes.

4. Owing to the low water velocity through the impeller and stationary passages, there is almost complete freedom from wear, even when pumping gritty water. This forms a marked contrast to the ordinary centrifugal pump, where facilities have to be provided for the renewal of blade tips and other parts, due to the excessive erosion. With much wear, of course, in pumps of such construction, the efficiency falls rapidly.

5. An outstanding feature of the Rees RoTURBo Pump is that both single and multi-stage pumps are in perfect hydraulic balance, thus eliminating the expensive marine thrust bearings and balancing pistons which are always liable to wear and give trouble as soon as the clearances of same become worn through pumping gritty water. A small two-way ball thrust is usually fitted, the function of which is merely that of a centreing block to maintain alignment between the impeller and the diffusors.

6. The strong and rugged design of the impeller, diffusors and casing insures complete freedom from noise and vibration.

7. The pump is especially suitable for use with liquid of a gritty or viscous nature, owing to the low velocity through the impeller and casing, and has been largely used for pumping thick oil, sugar, liquids, etc.

8. From a mechanical point of view the pump is fully standardized and all wearing parts are easily replaceable, being made to gauge and kept in stock, thus permitting quick shipments on receipts of orders for repairs. The design of the pump is specially adapted for a wide range of duties with a given pattern by small alterations, thus reducing the number of patterns carried to a minimum and enabling us to completely standardize all parts.

From the foregoing history, and detailed description of these pumps, it will be noted that efficiency is a very strong feature. These pumps are now being built in Canada, by the Goldie McCulloch Co., Limited, of Galt, Ont., who have secured the sole rights for these pumps in the Dominion.

Messrs. J. Samuel White & Co., Ltd., East Cowes, Isle of Wight, have received official information from the New York Shipbuilding Corporation, Camden, New Jersey, U.S.A., that 20 destroyers now being built in their shipyard for the United States Navy, are being installed with White-Forster Water Tube Boilers. These T.B.D.'s are each of 1,215 tons deplacement, and will develop a guaranteed 28,000 S.H.P. each, to give them a contract speed of 35 knots.

SCHOONER-RIGGED MOTOR VESSEL FOR CARRYING OIL IN BULK

WE illustrate, herewith, the Motor-ship "Katherine," the latest addition to the fleet of motor tankers, owned and operated by the Phillipine Vegetable Oil Commpany.

This vessel was formerly a four-masted square-rigged British-built iron ship, but has been converted into a six-masted bald-headed schooner, for the purpose of taking advantage of the favorable winds, although it is intended that the engines shall be the main source of power and run continuously. The dimensions of the vessel are as follows:

Length over all	286 ft. 9 in.
Length between perpendiculars	275 ft.
Breadth moulded	43 ft. 5 in.
Depth	24 ft.
Gross weight	2196 tons
Net weight	2087 tons

This vessel was completed in Oakland on the 27th August last, and after her trial trip, she left with a cargo of case oil for Manilla, where she will engage in her regular trade of carrying vegetable oils.

Her owners were advised by cable on the 25th November that the vessel had arrived in Manilla, after a satisfactory trip, covering a distance of, approximately, 6,800 miles in 34 days, or nearly 200 nautical miles per day.

The vessel is built for the carrying of oils in bulk, the hull having been divided into ton tanks having a total cargo capacity of 3,000 tons on 22 feet draft.

In addition to the oil cargo space provided by the tanks, the vessel has 20,000 cubic feet of dry cargo space, four winches having been provided for handling this type of cargo.

Propelling machinery in the vessel consists of two 320 B.H.P. Bolinder oil engines of the latest M-11 type. A feature of these engines being the latest improved Bolinder oiling system, which has resulted in a considerable reduction in the consumption of lubricating oil.

The auxiliary machinery consists of three Bolinder stationary engines of 25, 15 and 8 B.H.P. respectively, all direct connected to generators of 110 and 125 volts.

The fuel oil supply is carried in double bottoms, and in a fuel oil tank aft the engine room. The total fuel oil capacity is 2,200 barrels, sufficient for one hundred days running.



MOTOR TANKER "KATHERINE," EQUIPPED WITH 688 B.H.P. BOLINDER OIL ENGINE

The steering is accomplished by means of a well-known electric steering gear, fitted by the Herzog Electric Company, of San Francisco.

The vessel is equipped with a wireless telegraph, with a range of 3,000 miles.

During the trial trip, the ship was fully loaded, the cargo tank having been filed, and the draft forward indicated at 20 feet 2 inches, and aft 20 feet. The result showed a speed of 9.06 knots with the tide, and 7.02 knots against the tide, or an average of over eight knots.

The Philippine Vegetable Company is also operating the Bolinder-equipped motorship "Nuuanu," and are now completing the new motorship "Tankerville," equipped with twin 500 B.H.P. Bolinder engines.

It has been the experience on the Pacific coast that this type of vessel, rigged as the "Katherine," and properly equipped, is a most profitable type of tanker or freighter.

Sarnia.—Released from a bar where she had gone ashore a day or two previously, the tug Annie Moiles turned over and sank. Six men were aboard of her when she turned over, but all made their escape in safety. The tug went ashore while towing the scow Ontario.

A Series of Studies in Practical Marine Engineering

These Articles Will Appear Monthly and Will Take Up the General Principles Underlying the Design, Construction and Maintenance of Marine Engines and Boilers—For Apprentices and Students Generally

By T. H. FENNER, Extra Chief Engineer, M.I. Mar. E., London

WE spoke in the last article of the specific heat of gases at constant pressure and at constant volume. We said that the ratio of specific heat at constant presure to that at constant volume was as 1 : 1.405.

The specific heats under the two conditions have been determined by careful experiment. The specific heat at constant pressure being .2375, and at constant volume is .1689, then the ratio is:

$$\frac{Cp}{Cv} = \frac{.2375}{.1689} = 1.405$$

Taking the ratio in ft. lbs. instead of heat units we get the same result:

$$\frac{Kp}{Kv} = \frac{184.77}{131.4} = 1.405$$

This specific heat ratio has to be taken into account when considering the action of steam expanding and doing work in a steam engine.

Adiabatic Expansion

Expansion of a gas takes place in one of two ways. If it expands in a closed vessel which is an absolute non-conductor of heat, it will do work without either losing or gaining heat, to the walls of the vessel. Some of the heat will be transformed into work, but none will be lost. This is termed an adiabatic expansion.

Isothermal Expansion

In an isothermal expansion the gas expands at constant temperature, or we may say without loss or gain of temperature. In this expansion the pressure and volume always vary inversely, and $Pv = S$. If we have a cylinder, fitted with a piston, and an indicator is attached, we can move the piston up and down, and if the temperature of the air in the cylinder is kept constant, the pencil will trace a curve, following the same line at every repetition. This curve will be a graphic representation of the variation of pressure and volume, and will be an isothermal curve. The curve obtained by the indicator if the piston were moved rapidly in and out, so that the temperature was raised by the work done on the air, and this heat had no time to be dissipated by radiation, would be steeper than the isothermal. It would be adiabetic. The curve obtained in an actual engine is neither adiabetic nor isothermla but lies between the two.

The Working Cycle

As we have seen in an earlier article, heat and work are mutually interchangeable. This principle is borne out in the steam engine by supplying heat to a working fluid, which changes its heat into work by expanding against a piston, which drives a crankshaft. The heat is supplied by the combustion of fuel under a boiler, evaporating the water and forming steam, which is the working fluid. In the supplying of the heat to the water ther is loss due to the inefficiency of the boiler, and from the boiler to the engine there is loss through radiation. In the engine itself there is futher loss due to condensation on cylinder walls and passages. A very small portion of the heat contained in the steam is utilized in performing work, the larger part being rejected to the condenser with the exhaust, or to the atmosphere with a non-condensing engine. It will thus be seen how very imperfect as a heat engine, our steam engine really is. The internal combustion egine is much more efficient, the combustion of the fuel taking place in the working cylinder itself. This eliminates a considerable amount of the losses which are encountered by generating steam in a separate vesel. In the internal combustion engine the losses are due to the heat carried away by the jacket circulating water, and that rejected in the exhaust.

In neither of the cases just quoted have we completed the cycle. In a surface condensing steam engine the condensed steam from the engine is returned to the boiler by the fuel pumps. This makes a complete cycle from boiler to engine, engine to condensor, and condensor to boiler. In the engine exhausting to atmosphere and in the internal combustion engine the cycle is not followed through.

A closed cycle is any cycle in which the working fluid returns to its original state. The ideal cycle as described by Carnot is one in which this condition is fulfilled.

In this we have a cylinder, the walls of which are absolute non-conductors, fitted with a non-conducting piston, moving without friction. The bottom of the cylinder is conceived to be a perfect conductor, that is, it offers no resistance to the passage of heat. This cylinder contains one pound of a substance or gas. There is a source of heat, with which the cylinder bottom can be placed in communication, and a refrigerator, or cold body, also capable of being placed in communication with the cylinder bottom.

We will suppose the cylinder bottom to be placed in communication with the source of heat, the gas or substance contained in the cylinder being at the same temperature as the latter. The gas will receive heat and expand, doing work, but the temperature will remain constant. At a certain point the cylinder is removed from the source of heat, and the gas is allowed to expand, doing work, by which a certain amount of heat is changed into work, but none is lost to the cylinder walls or piston, and none is received. The cylinder is now placed in communication with the cold body or refrigerator, and the substance compressed, the heat developed by the work done on the substance being given up to the refrigerator, so that the temperature remains constant. The cylinder is again removed from the refrigerator and the gas is compressed, without receiving or losing heat from any outside source, till its pressure and temperature is again the same as at the starting point. Now, let us follow these four stages out, and see if we can apply the teaching of the previous articles to them.

First, we have an expansion without loss or gain of temperature, which is an isothermal expansion, and follows Boyle's law $p v_1 = p_1 v_1$.

We then have a further expansion in

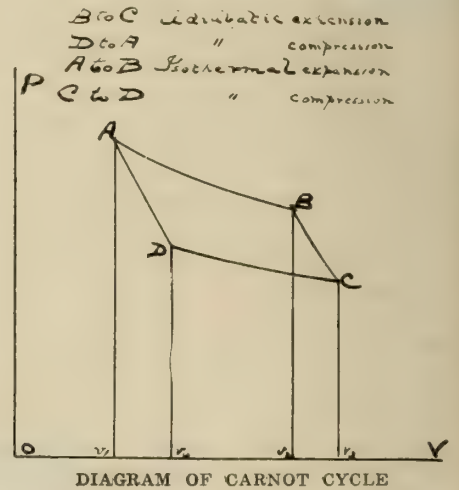


DIAGRAM OF CARNOT CYCLE

which the substance does work, the pressure and temperature drop, but no heat is lost or gained. A certain amount of heat is changed to work, but none is lost, this corresponding to an adiabatic expansion. The equation for an adiabatic expansion must be corrected to take in the ratio of the specific heats of a gas at constant pressure or constant volume.

This becomes $pv^{1.405} = p_1 v_1^{1.405}$

In these two expansions the substance has done work on the piston, and from a temperature corresponding to that of the source of heat, it has dropped to

that of the refrigerator or condensor. The piston now does work on the gas, compressing it, the heat of compression passing through the bottom of the cylinder to the condensor, this again being an isothermal compression, as the temperature remains constant. The lats stage is compresion of the gas to its original point, the heat of compression being retained, raising the temperature to that of the source of heat. This is an adiabatic compression. Now, the heat added to the gas has all been added at constant temperature, and the heat rejected has been rejected at constant temperature. The efficiency of the cycle is governed by the difference between the high absolute temperature and the lowest absolute temperature. This can be expressed by the formula:

$$\frac{T_1 - T_2}{T} = E.$$

The accompanying diagram shews the Carnot cycle in graphic form. The indicator card obtained from a steam engine resembles this in general form. The isothermal lines, however, are straighter. The action of steam in a steam engine will be discussed in a later article.

SHOULD VALVES BE SET WITH NO LEAD?

There has been some correspondence in the "Marine Review," of Cleveland, relative to the question of lead on marine engine slide valves.

The first letter published was from Mr. Harry Stone, and appeared originally in "The Bulletin" of the Lake Carriers' Association. Mr. Stone argued that lead on a slide valve was not only of no advantage, but a detriment. He spoke of the result of excessive lead being the pushing back of steam to the boiler by the piston. He also claimed that by eliminating lead a smoother running engine could be obtained, and the revolutions increased. He goes on record as being distinctly opposed to lead, and claims that all text-books which advocate lead, and all teachers who uphold it, are fundamentally wrong.

This letter brought forth a reply from S. H. Hunter, a veteran engineer of the Great Lakes. Mr. Hunter, while agreeing that excessive lead is detrimental, suggests that to get the best results, negative lead, or no lead at top, with ample lead at bottom, is required. He draws attention to the obliquity of the connecting rod affecting the equal distribution of steam at top and bottom ends of the cylinder. He also states that he would like some more reasons from Mr. Stone as to why he is opposed to lead.

Looking over these two letters, it would seem to the writer that both gentlemen had overlooked the fundamental object of lead. Lead is given to a valve primarily to eliminate the wire drawing, which would occur if the valve started to open at the same instant as the piston began its stroke. It must be borne in mind that the piston has travelled a considerable portion of its stroke before the maximum port opening is attained. That is the reason for adopting poppet and Corliss valves in stationary engines. They have the faculty of quick opening, thus tending to keep the admission line on the indicator card a straight line till cut-off takes place. Now, in considering lead of a slide-valve the two gentlemen have evidently neglected the fact that the edge of the valve which governs lead also governs cut-off. Therefore, in raising the valve up so as to obtain negative lead on top, they hasten the cut-off and reduce the maximum port opening. The inside edge of the valve which governs the exhaust has also been raised, and what happens then? Release takes place earlier and compression later. The effect would be in an engine of usual design a very much distorted card, with a by no means equal steam distribution. As regards the piston pushing the steam back into the boiler, the writer cannot conceive of such a happening. The aim striven for in most engines is to have the compression pressure rise to that of the receiver pressure at the instant the valve opens to admission. This is shown on the indicator card by the compression curve running smoothly into the straight line. As the pressure in the boiler is always appreciably higher than that in the receiver, there can be no pushing back. If we have excessive lead, which also gives late exhaust release and excessive compression, there is a temporary rise of pressure above the receiver pressure, forming a loop at the top of the card. The result of absence of lead would be the very quick drop of the steam admission line from the commencement of the stroke, with a corresponding reduction of area of the indicator card. This means less work and less revolutions.

A certain amount of cushioning is necessary, both to check the inertia of the moving parts and to fill the clearance space with steam. If this is not done, the clearance must be filled with live steam, a dead loss. The functions performed by the steam and exhaust edges of the valves should be differentiated, and excessive compression should not be confused with excessive lead.

Correspondence on this question will be welcomed.—Editor.

LLOYD'S SILVER MEDAL FOR BRAVE ACTION.*

The Committee of Lloyd's have awarded Lloyd's Silver Medal for Meritorious Services to Mr. Finlay John Murchison, Master of the barque Wathara, of Port Adelaide, as an honorary acknowledgement of his gallant conduct in going aloft during a gale which his vessel encountered on her voyage from Australia to England on April 25, 1919.

While the Wathara was on a voyage between Australia and England, she encountered a terrific gale in lat. 41 deg. 50 min. S., long. 41 deg. 47 min. W., on April 25, 1919. When the gale was at its height, the port main topgallant backstay and chainplates carried away. All hands were expecting the topgallant mast to carry away any minute, as it was swaying from side to side with every roll of the ship. The master and officers considered the risk too great to order any of the crew to go aloft with a preventer stay. Mr. Murchison, at great risk, took a four-inch manila rope aloft and got the end of it fast round the swaying mast. All hands immediately set the line taut with the capstan on deck. The preventer stay secured the mast until the gale was over. If it had not been for the risk Mr. Murchison took, the mast would have carried away, and would have put the vessel in very great danger owing to the heavy sea that was running at the time.

It appears that, before going aloft, Mr. Murchison said good-bye to his wife and little son who were on board, as he hadly expected to return to them again, and, after his mission was successfully accomplished, he suffered for some days from the intense strain, mental and physical, to which he had been subjected. *Lloyd's List.

PORT ARTHUR SHIPBUILDING COMPANY

A Successful Year

The Port Arthur Shipbuilding Company have a very creditable year's work to record. They have delieved to the Canadian Government Merchant Marine four 3,400-ton steamers, the "Canadian Trader," "Canadian Sailor," "Canadian Adventurer" and the "Canadian Sower." The "Canadian Adventurer" enjoyed the honor of being launched by H.R.H. the Prince of Wales on the occasion of his visit to the yard.

In addition to the above, they completed four vessels for the Department of Naval Service, which were commenced in the late fall of 1918. The yard has been kept busy on repair work, thirty vessels having been overhauled, the work in more than twenty cases necessitating the docking of the vesels. At present they have two 4,300-ton steamers in course of construction, which will be ready for delivery in June or July next. They will be taken to Buffalo, where they will be cut in two and taken down through the canals to the St. Lawrence. They will be rejoined in Montreal, and run their trial trips before final delivery is made to the Department.

Last year's work was slightly greater than this, consisting of six 3,400-ton steamers, six trawlers, and one sea-going tug. This work was done under war conditions, requiring a lot of overtime. This year the plant has been kept steadily at work, the number of employees having been throughout the year within two hundred of the number employed last year.

France Adopts Oil Fuel.—Trials have been made on an old locomotive on the leading French railway, with a view to ascertaining the possibility of burning oil instead of coal under the boilers. The trials have proved so successful that two hundred locomotives are being fitted with the burners for the new fuel immediately.

Eastern and Western Canada Marine Activities

December Correspondence

Montreal Notes

QUEBEC, Dec. 21.—It was learned through the signal service here tonight that the steamer Canadian Recruit, which is ashore on the rocks at Vache Point, is in a bad way and the holds of the vessel are full of water. When the news of her grounding was learned by the signal service on Saturday, ice canoes were ordered out from Tadousac and the officers and crew were taken off the vessel, which had been calling for assistance for some time. The Government steamer Lady Grey, which had been unable to reach the Canadian Recruit, owing to ice and fog conditions, put back to port here on Saturday to replenish her coal supply, but was delayed in leaving owing to fog. It is explained that the Lady Grey and Lord Strathcona will leave here for the scene of the wreck tomorrow morning.

Capt. E. J. Edwards has been appointed Trade Commissioner for Montreal, succeeding G. T. Milne, who will join the British Legation in Cuba as commercial secretary. Mr. Edwards is now in England, but will leave there shortly to assume the duties of his new office. He has been associated with the British Naval Service and latterly as salesmanager of a large manufacturing firm.

While coming down the Lachine early in December the coal barge Cadorus went ashore near Dickinson's wharf, some 70 miles above Montreal, and resulted in blocking navigation for several days. Due to this accident the second section of the Northland was held up for several days, long enough to prevent her making the trip before the close of navigation, so that she will require to remain separated from her better half until the spring. The first section is berthed at Quebec, where the vessel will be put together.

The Marconi Wireless Telegraph Company of Canada has purchased the four-storey stone structure at 11 St. Sacrament St., Montreal, and will utilize the greater portion of it for the main offices of the company. This building was originally erected for the Montreal Stock Exchange. The offices will be entirely remodelled and the building known as the Marconi Building. The company will still retain the factory on William street. It is also proposed to open a school for the training of wireless operators.

With the sailing of the Canadian Government steamer, Canadian Planter, from the Canadian Vickers yard, on December 12, the commercial closing of the port of Montreal became effective. The official termination of harbor operations, as far as ocean activities are concerned, took place a few days earlier when the Elder-Dempster freighter Bassa sailed for South Africa. This vessel had to undergo light repairs after being stuck on the mud bank for over a week, during which period she had to be lightened of a large portion of her cargo.

Owing to the pronounced scarcity of coal, the Canadian Trade Commission has taken steps to regulate the distribution of existing supplies on a preferential basis. In connection with the bunkering of boats at Canadian ports, vessels under the Canadian flag will receive the first consideration. Generally speaking, boats applying for coal will only be supplied with sufficient to reach their destination. It is recommended that, as far as possible, bunkering will be carried out at Sydney on account of the proximity to the mines.

The closing of the port of Montreal for the winter season has transferred the shipping activities to St. John, N.B., and this latter terminal will take care of the bulk of the imports and exports of Canadian trade. In view of the growing importance of the city of St. John it has been proposed that better hotel accommodation should be furnished and to this end plans have already been prepared, and the committee in charge have recommended a structure of about 200 rooms at an estimated cost of approximately $900,000, of which $700,000 has already been raised.

T. B. Macauley, president of the Sun Life Assurance Company of Canada, who has recently returned froma visit to the West Indies, addressed a recent meeting of the Montreal Board of Trade on the subject of "Relations With the West Indies." Mr. Macaulay is quite enthusiastic over the trade possibilities with these colonies, and believes the time is opportune for Canada to share extensively in the development of the West Indies, not in the sense of union with this country, but in close co-operation with local authorities and business houses, believing that close co-operation between the colonies is essential to Empire progress.

At a recent meeting of the Montreal Chambre de Commerce, Lieut.-Col. Hercule Barrie, newly appointed Canadian Commerce Commissioner to Paris, emphasized the importance of Canada's commercial representation in many parts of the world, portending a new era of development and prosperity for Canadian trade. He remarked on the lack of definite information that the Department of Commerce at Ottawa had in respect to Quebec industries and commercial activities, adding that he did not blame the Government so much as the business men of the province in not giving to the department the necessary information.

Recognizing that direct steamship connections between Canada and the British West Indies is one of the chief necessities for the development of export trade, the Montreal Board of Trade, at a recent meeting, unanimously decided to consider the question of confederation of the Islands with the Dominion. While expressing satisfaction with the great improvement made in steamship service by the vessels of the National Marine Service, the members felt that even the present efficient service is entirely inadequate to the existing and early future requirements, both as to freight and passenger traffic. A committee of prominent Montreal business men are leaving on a business trip to the West Indies, and they have been authorized to take up the question of closer political relations with the Chamber of Commerce in the Islands.

A tribute of the Canadian Marine Department, and to the Montreal Harbor Commissioners in particular, was recently given by Capt. Griffiths, of the C.P.O.S. liner, Scandinavian, when that vessel docked on her last inward voyage of the season. "I have been on this route for the past 22 years," he said, "and the thing that struck me most as we came up the Gulf and the River was the difference between present conditions and those prevailing when I started on the service. Then it was impossible to come up the river at night at all, and the port of Montreal was a very medieval concern. On our present trip we were able to proceed at full speed from the entrance to the Gulf, day and night, until we slowed down to swing into the berth, everything along the way being lighted up, so that we had not the slightest difficulty, not only for the light in the channel, but the sighting lights on the shore. And when we got into the port the arrangements were as perfect as any commanding officer could desire. Whoever may be responsible for it, the port of Montreal to-day is about as fine a port and harbor as exists in the world, and its accommodation for vessels coming in are wonderfully good."

The revival of the project to deepen the St. Lawrence for the passage of ocean vessels is again to the fore, and the possibility has created considerable adverse feeling among New York and American shipping men. The statement of J. S. Duthrie, of the MacDonald Lumber Company, who has been a consistent supporter of the St. Lawrence Canal scheme, emphasizes the advantages of such an undertaking, and says in part: "Ocean vessels will be unloading in the ports even of Lake Superior within ten years. The only thing that will delay it is the fact that the Government has taken over the G.T.R. and tied up the finances of the country for the time being, but that will soon be past. The people of New York see the real facts of the case."

S. A. Thompson, the secretary of the Convention of National Rivers and Harbors Congress, expresses the mind of the eastern section of the States in the following remarks: "Like all the rest of us, the people of New York and the Eastern States want all the business that they can get, and because they think, and with good reason, that a thirty-foot channel down the St. Lawrence could not only benefit Montreal, but take a great amount of business away from New York, they are violently opposed to the United States Government taking any part in the project."

The increasing trade that is constantly developing between Canada and overseas countries has resulted in the Government taking greater interest in the facilities of the ocean terminals that will be called upon to take care of this expanding traffic. There is every possibility that the port of St. John, N.B., will be slated for extensive improvements and additions in the very near future, as Government representatives recognize the importance of this nerve centre of the inter-continental trade system. Speaking on this subject recently, A. P. Barnhill, K.C., one of the directors of the C.N.R., said: "The important matter now for the city of St. John is not so much the railroad service as terminal facilities for ocean business. The railroad service is here, but we still lack facilities for increasing ocean business that will soon come here. In answer to my representations that St. John is entitled to consideration in the allotment of steamers equal to that given to any other port, the fear has been expressed that there will be congestion at this port. That is, the facilities are not adequate for the steamships which are scheduled to arrive here. It is apparent that these facilities must be greatly increased at once to take care of the business of the immediate future."

The effects of the war have not yet been entirely obliterated from marine circles ,as is shown in the reported operations of the Lachine Canal for the past season. Some vessels diverted from inland ervice during the war are still absent, but unprecedented movement of shipping has been evident in the boats passing down from the Great Lakes. In all, about 313 new boats passed down, and few of these will make the return trip. These include 188 ships built for the U. S. Shipping Board and the I.M.B.; 21 tugs, 29 vessels for the Canadian Shipping Federation; 60 Eagle submarine chasers and 15 other craft. The displacement tonnage was greater this year than last, but the cargo carried was lighter, the freight tonnage being 2,807,209 in 1919, against 2,929,121 in the previous year. The passenger traffic this year exceeded last year by over 23,000, the figures for this year being 68,600 passengers.

The increase in the grain movement was quite pronounced, wheat alone totalling over 18 million bushels, as compared to a little over 5 million in 1918. With the exception of oats and flaxseed, which showed decreases, tonnage of all grains was considerably higher. Coal traffic was seriously interferred with and the figures given show heavy decreases. The shipments to the harbor fell off about 558,700 tons in soft coal, and over 29,000 tons of anthracite, the figures for 1919 being 771,180 tons and 36,446 tons respectively. Comparative hard coal shipments to the Canal was 276,473 tons in 1918, and 217,037 tons this year. The navigation period this year was 238 days, one less than last year, the closing dates being December 10 for this, and December 17 for last year.

M. P. Fennell, secretary of the Montreal Harbor Commission, has been elected to the office of secretariat of the American Association of Port Authorities, and this office will now be transferred to this city. It is interesting to note that this is the first occasion that a Canadian has held this office.

British Columbia

AT the moment of writing, the Pacific Coast is still without word of new Dominion Government ship contracts, but a delegation has left Victoria for Ottawa, and advices have been received which indicate that on its arrival in the Federal capital a deal will be clused for the placing of new orders with both the Foundation Company and Cholberg Shipyard, of Victoria, and probably with Vancouver shipyards as well. It is understood that the Government is prepared to continue wooden shipbuilding as a temporary expedient more for the purpose of affording relief to the unemployment situation than anything else, and that it is now ready to sign an agreement as soon as the bonds are guaranteed. It seems probable that the Government will be required to put up 80 per cent. of the capital as a loan to private interests, who will provide the remainder. The interest charged will be about 6 per cent. The type of vessel to be built will be wooden schooners in all probability, as this will make it possible to get operations under way without delay and will also make use of locally-produced material. Coast lumbermen still swear by the wooden schooner as an economical carrier, and as lumber is the principal commodity to be shipped, their word will carry considerable weight.

The Vancouver Steamships Company and the Western Canada Steamships, Ltd., understood to be subsidiaries of the big shipbuilding concern of John Coughlan & Son, have been incorporated at Vancouver with capital fixed at $2,000,000 each. Their formation is believed to be the outcome of Mr. J. J. Coughlan's long-cherished policy to construct a line of steamships to be owned and operated by his own company. Each of the new concerns, it is reported, will build one 8,800-ton steel standard freighter initially. The number will increase as business warrants. The vessels are to be built in Vancouver at $170 a ton.

Mr. J. J. Coughlan is still in the East, looking for orders, but the company appears to be convinced that private enterprise will soon have to be depended upon entirely as a means of keeping the yards going. Progress is well under way on the Canadian Government vessels being built by the Coughlan Company. The first of the four boats to be built to Federal account, the Canadian Importer, was launched December 7. The vessel will be the first to go on regular service between Vancouver and Australia, with general cargo for the Canadian Mercantile Marine. It will take several weeks to outfit the steamship, but 75 per cent. of the space has already been reserved.

Following arrangements previously made by Pacific Coast and Eastern stockholders of the Pacific Steamship Company, it has been decided to issue preferred cumulative 7 per cent. stock amounting to $25,000,000 to carry out plans for expansion. While the company's programme has not yet been definitely outlined, it is believed to embrace the construction and operation of two fast passenger and freight steamers between San Francisco and Puget Sound and British Columbia ports, cutting down the time of travel between the Golden Gate and Cape Flattery to less than thirty-six hours. Further development of trans-Pacific services is also contemplated.

Because of the shortage of passenger vessels and the fact that the refitting of the former German liners will require three months, it will be some time before any new passenger ines can be established between the Pacific Coast and the Orient, Chairman John Barton Payne, of the United States Shipping Board, recently told a delegation of Pacific Coast shipping and business men. He gave assurance, however, that the Board would make every effort to relieve the situation as soon as possible. Charles G. Moore, of San Francisco, leader of the delegation, informed Judge Payne that American trade with the Far East was three times as great as that with South America and that the business was seriously handicapped by shortage of tonnage. Practically all passenger traffic, he declared, was handled by foreign shipping companies.

The following telegram, emphasizing the extent of unemployment in Victoria as a result of the cessation of shipbuilding operations, was dispatched a few days ago to Sir Robert Borden by James Dakers, president of the Victoria Metal Trades Council:

"Unemployment situation here extremely serious. With exception of Harbor Marine Company employing about four hundred men, shipyards at this point closed down as contracts are

completed. Eleven slipways idle and large fitting-out plant closed yesterday. As no other important industry employing white labor is carried on in district, five thousand men thrown out of employment. Authentic statistics show fourteen thousand nine hundred souls out of estimated population of thirty-nine thousand are directly affected, not including men in lumber camps, tug boats, offices, stores and so forth. In view of Sir Henry Drayton indicating that success of Victory Loan would mean further work and of winter season and rapidly rising cost of necessities causing tense feeling among unemployed and considerable privation. Strongly urge immediate statement as to Government shipbuilding policy both in wood and steel to assuage situation.

The Victoria branch of the Canadian Merchant Service Guild has passed a resolution asking for the establishment by the Dominion Government of a steamship line between Vancouver, Victoria and San Francisco. The Pacific Steamship Company, operating the Admiral line of steamers, has resumed sailings between 'Frisco and British Columbia ports. The Pacific Steamship Company is an American concern.

A course in navigation has been arranged under the Soldiers' Civil Reestablishment and will be open to returned men on the Pacific Coast who desire to take out certificates. The course will extend over from six to eight months. Captain Jarvis, well known as a surveyor and compass adjuster, will have charge of the classes.

Speaking of the future of Japan's shipping, Baron Rempei Kondo, president of the Nippon Yusen Kaisha, which operates a fleet of carriers between the Far East and Seattle and Victoria, recently stated on his return to Tokyo from the peace conference:

"It is very doubtful whether the movements of cargo, with Japan as a centre, will increase in future. If Japan builds only such ships as are suited to the shipment of such cargo alone, it is pretty certain that the tonnage will become excessive. Under the circumstances we should, in the future, endeavor to develop our shipping trade between foreign countries. Considering the geographical position of Japan, it may be said that the South Seas form the best centre of operations for her shipping. . . . In short, the day has passed when Japanese merchantmen may operate with Japan as a centre. We should hereafter shift the centre of our operations to the South Seas to develop our shipping trade all over the world.

St. John, N.B.

The four-masted schooner, the "Cutty Sark," was launched from the yards of Grant & Horne, Courtenay Bay, St. John, N.B., on December 8. The schooner was appropriately christened by Mrs. Pugsley, wife of the Lieutenant-Governor of the province. An attempt had been made to launch the ship on the Saturday previous but she was frozen down and would not move at the proper time. It was expected that this will be the last wooden ship constructed in St. John for some time.

The Port of St. John has been tied up for nearly two weeks on account of the walk-out of the freight handlers. The men demanded sixty-five cents an hour. It was finally arranged that they should resume work at forty-seven cents an hour, and that a conciliation board be appointed. This agreement has been carried out and sessions of the board are now being held. Many steamers were diverted from this port to Halifax and Portland, Me., on account of the strike.

Admiral of the Fleet Viscount Jellicoe visited St. John, N.B., on December 12. He was taken for a trip about the harbor and viewed the operations on the site of the new drydock, which is to be completed within two years and is to be the largest on the Atlantic seaboard.

The C.P.O.S. steamer Corsican sailed from St. John December 14 for London. She carried a general cargo besides 600 first-class and 700 third-class passengers.

The steamer Lake Ellsbury, which was in the harbor of St. John for seven days, during which time her propeller was repaired, sailed for the United Kingdom with a full cargo of grain on December 14.

The C.P.O.S. steamer "Montcalm" arrived in St. John, N.B., on December 12, with a general cargo. She had been held up for several days on account of the storms on the Atlantic

Capt. A. J. Mulcahey, of St. John, N.B., has been appointed to the position of issuer of bunkering licenses for this port.

The master and fifteen of the crew of the wrecked steamer Colmar reached St. John, N.B., on December 8, on board the steamer Mississippi. The Colmar was wrecked off the Nova Scotia coast during the week of December 8. The men were taken to Halifax.

The first steamer for the service between Canada and France left St. John, N.B., on November 24 with a general cargo for Havre.

The Atlantic coast of Canada has been visited by a severe storm during the last few days. Many steamers and sailing craft have been reported in distress.

MAY BUILD STEEL COASTING VESSELS

Another steel shipyard will probably be running full blast by next summer, according to reports on the waterfront today. It is stated that the B. C. Marine Limited is going to equip a plant for construction of steel coastal pasenger and freight steamers up to 2,500 deadweight tons. Mr. Innes Hopkins, managing director of the B. C. Marine, refused either to deny or confirm the rumor. It is believed that the new area recently added to the present plant was for the purpose of providing space for this new shipbuilding equipment.

The B. C. Marine is now engaged on a great deal of repair work to vessels, and is completing the wooden steamer Capilano of the Union Steamship Company. This vesel will be launched on December 20, Mrs. E. H. Beazley acting as sponsor.

CONTROL OF MOTOR SHIPS

It is reported that in several motor ships of 9,500 tons deadweight capacity now under construction at Gothenburg, Sweden, the engines will be controlled from the bridge by the navigating officer without the intervention of the engineers on watch in the engine-room. The propelling machinery of these ships comprises two four-cycle 200 i.h.p. Burmeister and Wain type Diesel engines, so that the experiment is to be carried out on one of the most modern class of motor vessels.

There should be no difficulty of any magnitude in carrying the proposal into effect (says the "Scientific American"). In all marine Diesel engines there are, virtually, only two operations that have to be carried out in manoeuvring: First, the camshaft has either to be turned trough an angle relative to the crankshaft, or has to be moved longitudinally, so that the setting of the cams may be correct for the direction of rotation that is required; and, secondly, compressed air has to be admitted to the cylinders, followed (by a continued motion of the same lever) by admission of fuel and the simultaneous cutting off of the compressed air supply.

Both of these operations can easily be effected from the bridge. In any case, the first is usually carried out by the admission of compressed air to a small servo-motor, and its control is the same in principle, whether it be from the bridge or from the engine platform, for it is merely a question of prolongation of the air-supply piping.

The second movement, which is usually by hand, will no doubt be made by means of a small electric motor, with the control switch on the bridge. The throttle, for increasing or decreasing the speed of the engines when running, can, of course, easily be taken to the bridge, either mechanically, or an electric relay system can be employed.

It will be iteresting to learn whether this system of control shows to any great advantage. Its chief value, no doubt, is that it eliminates the human element, and prevents orders from the bridge being wrongly fulfilled. It should also give greater speed and accuracy in manoeuvring; but, on the whole, we are inclined to look upon it as an interesting innovation rather than a development of any great importance.—Journal of Commerce.

New York.—The "Imperator," the huge ex-German liner, will make her first voyage under the British flag this week. She will carry 600 first, 400 second, and 1,500 third cabin passengers. She will receive sufficient bunker coal for the voyage to England.

PROGRESS IN NEW EQUIPMENT

There is Here Provided in Compact Form a Monthly Compendium of Shipbuilding and Marine Engineering Auxiliary Product Achievement

THE NEW COPES REGULATOR

IN 1912, the Northern Equipment Co., Erie, Pa., brought out and patented the now well-known continuous feed principle of boiler feed control. They showed that water should be fed proportionately to and variably with the load. This gives a variable water level temporarily inversely proportional to the load; it gives a temporarily decreased feed on sudden increase in load; and a temporarily increased feed on sudden decrease in load.

Up to the year 1912 all feeding was intermittent in character and an absolutely constant water level was considered ideal. Now, however, opinion is unanimous with regard to correct feeding and authorities agree that the so-called "Copes Method" is correct in principle.

Since the introduction of this mechanical regulator changes have been made from time to time in the details of construction, the principle of feeding in the meantime remaining the same as that cannot be improved.

Fig. 1 shows the design of the new Copes control valve. It will be noted that the reciprocating stuffing boxes have been abandoned, and in their place we have a horizontal shaft which rotates very slightly, performing the same function as the old reciprocating rod. Naturally, this new design is very sensitive. The frictional resistance has been reduced as much as 6 to 16 pounds. It is now practically zero because the shaft rotates very slightly and the same part of the shaft is always in the stuffing box.

The valve, as will be noted, is of the balanced piston type. The weight on the valve lever exerts a constant closing force of 50 pounds on the valve piston at all times. A weight is used here rather than a spring, because gravity does not vary, whereas springs grow weak with age, corrode, stick, break, etc.

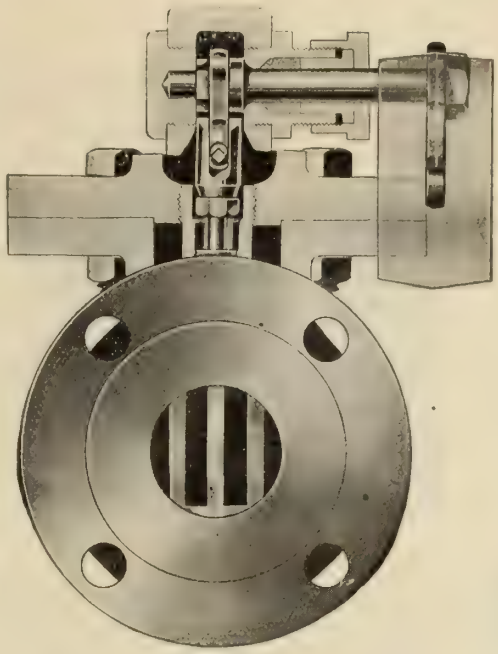


FIG. 2.

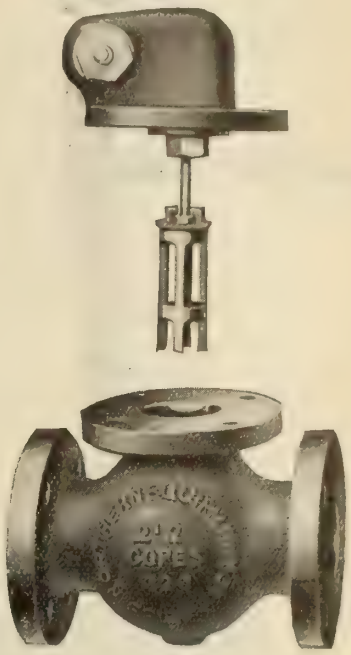


FIG. 3.

A vertical section through this valve is shown in Fig. 2, which displays the horizontal shaft, the stuffing box, the link work connecting the shaft with the piston valve, etc.

Another novel feature is shown in Fig. 3. The valve cap or bonnet can be unbolted and removed with fittings attached as photographed without removing the valve body from the pipe line. Any engineer will appreciate the great advantage inherent in this feature.

Fig. 4 shows how easily valve fittings are removed and renewed. A monkey wrench or any other kind of a wrench and a piece of flat stock are the only tools required. One of the seats is here shown after removal.

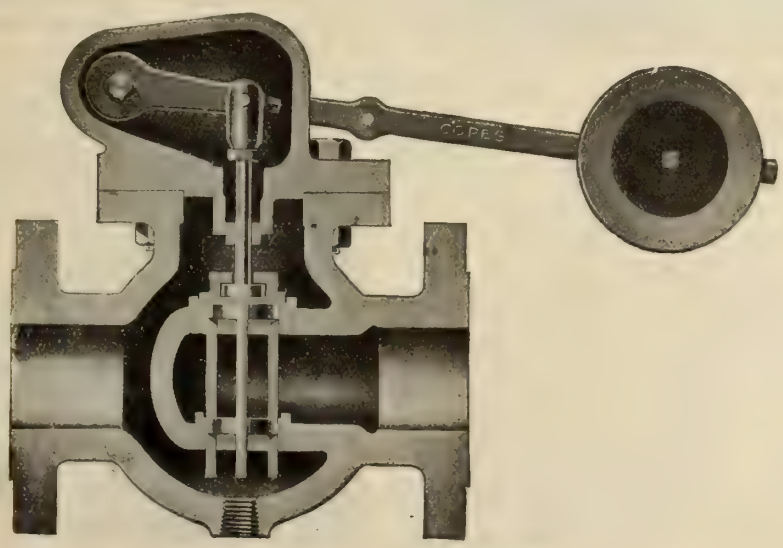


FIG. 4.

The assembled regulator complete is shown in Fig. 5. It consists principally of a heavy expansion tube—the long diagonal tube plainly visible in the illustration. This is known as the "thermostat." It is a straight piece of heavy metallic tubing 1⅛ in. in outside diameter. There is nothing about it to wear out, and as stated by the manufacturer it will "outlast any boiler." The top of the thermostat is connected with the steam space of the boiler and the bottom with the water space. Hence there is a water level in the thermostat corresponding with the water level in the boiler. It is this water level in the thermostat that determines the rate of feed. The tube lengthens and shortens with drop and rise of water level. The lengthening and shortening are caused by change in temperature of the tube as the water rises and fails. This expansion or contraction is amplified by means of the link work plainly visible in Fig. 5, and through the link work operates the control valve. All parts are simple, strong, heavy and rugged.

A Copes name plate has also been added as shown in Fig. 5. This has been done because regulators are usually placed on the level with the water in the drum, which is high above the heads of the operators or observers, hence the regulator is not noticed, and is often entirely forgotten even by the plant operatives.

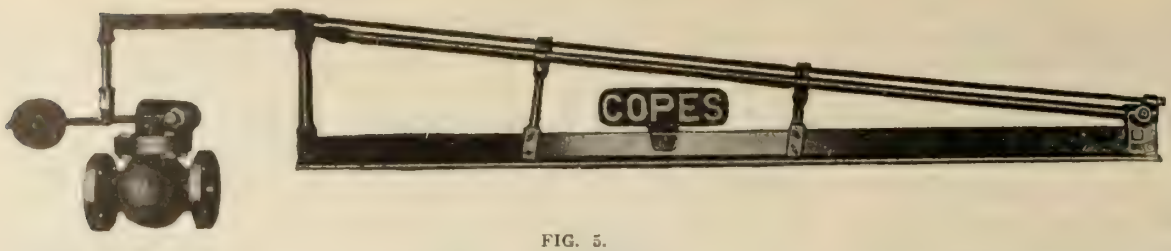


FIG. 5.

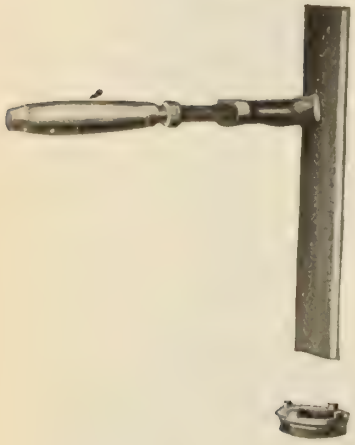




FIG. 4.

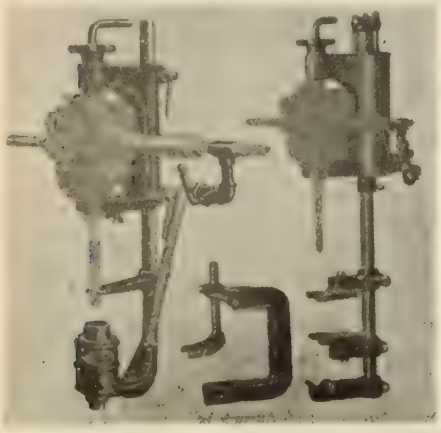
LABOR-SAVING SHOP TOOLS

The Liberty Tool Company, Baltimore, Md., is showing a number of new devices designed to effect time and labor saving in shop work.

Portable Drill Presses

A portable drill press, designed to fit any make or shape of air drill having a vertical motor, is especially adapted for drilling and countersinking flange and plate work, such as firedoors, flue sheets and door sheets. This device has a 2¾-in. pneumatic feed end and is equipped with a sliding head taking any work from ½ in. to 14 in. thick. It will drill holes from ½ to 1 5-16 in. and countersink up to 2 in. in diameter.

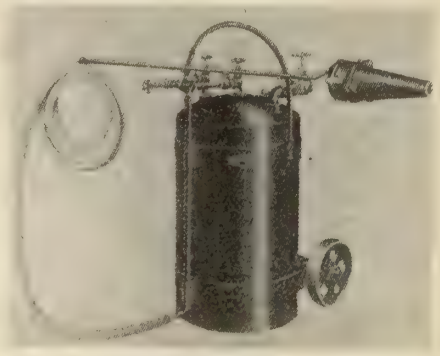
A double cylinder portable drill press with a crowfoot attachment is designed for any class of work and fits any of the pneumatic drills commonly used. It is equipped with a sliding head and a sliding table, has an 8 in. pneumatic feed and will drill holes up to 1 5-16 in. and countersink to 2 in. in diameter. It can be used as a radial drillpress up to 18 in. in diameter of hole circle and the sliding head can be adjusted to take work up to 14 in. in thickness.



PORTABLE DRILL PRESS



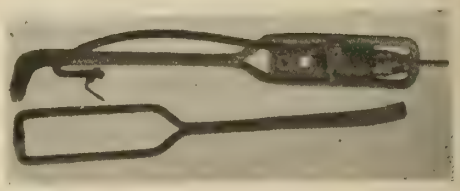
RIVET HEATING FURNACE.



PORTABLE HEATING TORCH.

Rivet Heating Furnace

A portable rivet heating furnace using oil as fuel is designed so that the point of the rivet may be heated to any desired temperature, while the head is heated only to a cherry red or sufficient to readily conform to the work in the riveting operation. The top of this furnace is pierced with holes, through which the rivets are inserted, so that the point of the rivet is in the flame, while the rivet head rests on the outside or top of the furnace. The intensity and uniformity of heat may be regulated by means of a control valve.



HOLDING ON BAR

Portable Heating Torch

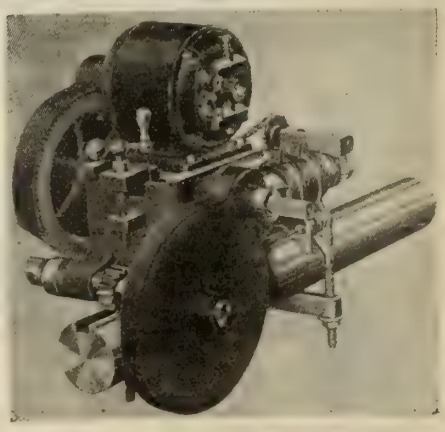
This apparatus consists of a fuel tank, a hose and a burner. The torch has one line of hose leading from the tank to the burner, which makes it convenient to handle in close places. This torch will heat to any desired temperature and may be used in the open air with excellent results.

Holding-On Bar

This holding-on or dolly bar has a pneumatic clamping device secured in a rectangular frame which is part of the bar itself. The bar can be placed in position quickly and the recessed end tightly clamped over the rivet. It may be readily applied in close quarters and is especially designed for use in locomotive flue sheet riveting and repair work. This company is showing a heading attachment for a riveting hammer, designed to rivet stay bolts and stay rods or countersink rivets and also a portable drill press for a close corner motor.

BUCHER-SMITH KEYSEATING MACHINE

The Bucher-Smith Co., East Liverpool, Ohio, is now manufacturing a portable motor-driven keyseating machine, in addition to its Style A hand-power machine. The machine shown is known as style A-2, and has a spur-gear drive. The sliding head is cast solid to the spindle; the feed screw, be-



PORTABLE KEYSEATING MACHINE.

ing inside the spindle, keeps the pulling strain close to the shaft. A power feed is furnished by a sprocket-chain connection from the main shaft to worm gearing on the screw. The depth of cut is regulated by the vertical screw shown above the cutter. The main shaft is squared on the end for a wrench, thus permitting hand-power operation if current is not available. The motor furnished is either alternating-current or direct-current and the power connection is usually the nearest lamp socket. The machine will cut keyways from ¼ to 1¼ in. wide by 12 in. long, and is suitable for shafts from 1¼ to 5 in. in diameter.

LOCATION OF RAILS IN BUCKET CONVEYORS

By John S. Watts

It is a peculiar fact, but all the bucket conveyors the writer has ever seen are built with the rails placed as shown in Fig. 1. That is, with the upper and lower rails in line with the tread of the wheel, when the wheel is at low point of the vertical movement, due to the revolution of the sprocket.

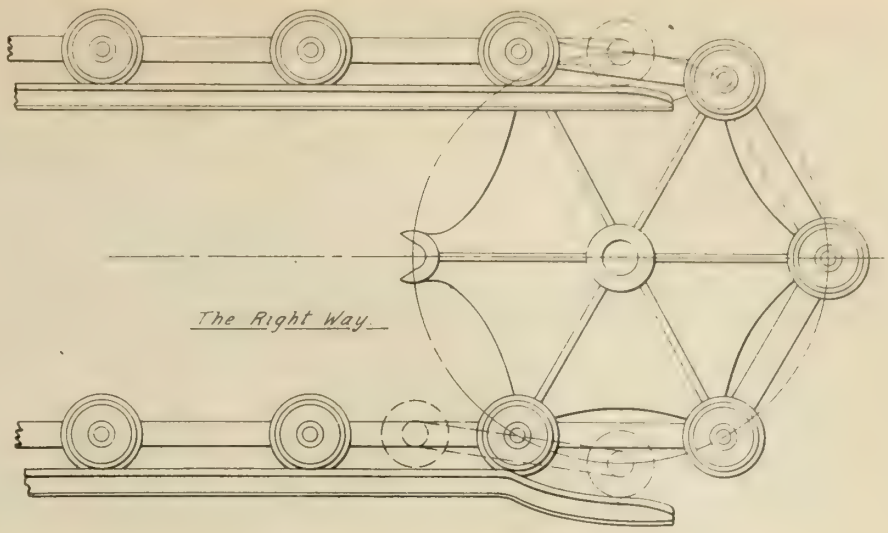
It must be admitted that to anyone without experience in operating these conveyors, the position of the rails shown in Fig. 1 would appear to be the correct one, but it is not, as will be shown in what follows:

In the sketch, Fig. 1, is indicated by dotted lines, the wheels in the position they will occupy when the sprocket has revolved 30° from where it is shown in full lines.

Taking the upper rail first, we find that the wheels and buckets have been raised from the rails, and of course will fall back on the rail when the sprocket revolves through another 30°.

On the bottom rail the same raising and falling of the wheels and buckets takes place, as is shown by the full and dotted lines.

With the large buckets now in use weighing as much as 3,500 pounds when loaded, the rising and falling causes a constant hammering of the wheels on the rails, accompanied by a deafening noise and destructive vibration in the whole structure. I have seen this effect so severe as to break the wheels.



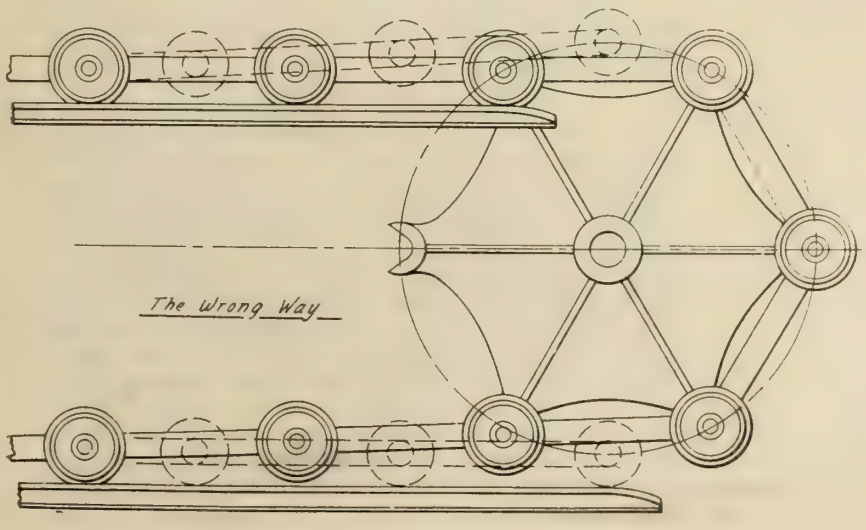
The remedy for this hammering is to raise the rails up to the position shown in Fig. 2; this, as a perusal of drawing will show, prevents the wheels from ever rising from the rails and there cannot, therefore, be any hammering.

This change in the location of the rails can be made in conveyors already built by blocking up the rails to the required amount at the sprockets. The track may not be raised throughout the whole length of the conveyor as it will answer our purpose just as well if we start at that point at which the wheels commence to leave the rail. At this point the rail should commence to rise on a gradient such as to bring it up to the height shown at the sprocket, in Fig. 2.

PORTABLE LIGHTING FOR MACHINES

No matter how well-lighted a machine shop may be from a general effect point of view, the portable form of local illumination is always a necessity. The overhead fixed lamp, whether gas or electricity be the medium employed, may be quite adequate for setting up a job in a machine, or for subsequent plain, straightforward operations, but when it comes to precision work of a fine character, intricate operations, and a close attention to scribed lines, pop marks, or in measurement checking in thousandths, then the shadows created by interposing solid objects, and the lack of concentrated light, local rather than general, makes accuracy and working comfort a difficult proposition. It is a debatable point whether gas or electricity makes the best form of portable light; personally I am inclined to the former.

A convenient type for general machine operations is that which consists of just a short vertical length of, say, ¼ in. iron tube, furnished with an ordinary burner and a tap; the base being a fairly heavy block of lead, having a broad, flat bottom so that it shall not easily topple over. And it is always the better plan to use flexible metallic tubing rather than plain rubber. Often, too, it is desired to show a light some way down a deep hole that is being bored out or recessed, either in lathe or vertical boring mill. It will be found that an excellent portable lamp can be made by utilizing a length of ¼ in. iron tubing welded up at the end and having drilled up the centre a 1-32 in. diameter hole.



According to the London and China Telegraph, the present price of coal at Singapore is 45 dols. per ton, which is equivalent to about £5 per ton. Fuel oil on long contracts can be obtained at that port at about £3 5s. per ton. Taking a steam and motor ship of the same size and power, having a deadweight carrying capacity of about 10,000 tons and a speed of 11½ knots, the motor ship would use about 12 tons of oil per day, whilst the steamer would require approximately 45 to 50 tons. The daily fuel bill of the steamer bunkering at Singapore would therefore be somewhere in the neighborhood of £250, whilst the coresponding figure for the motor ship would be £39, a saving of £211 per day. The price of coal at ports in the Dutch East Indies is apparently even greater, the figure at Batavia for bunkers being 135s. per ton.

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Winter Navigation of the St. Lawrence

KEEPING the St. Lawrence Gulf and River open all the year round has long been a dream of Canadians. That it would be a wonderful thing for the country nobody can doubt, but that it will ever be feasible is improbable. The advisability of spending millions of dollars on enlarging canals which will be useless for six months of the year is questionable. In this connection it is interesting to note the experience of the "Canadian Voyageur," as described in the official report of the Department of Marine and Fisheries.

The "Canadian Voyageur" was the first steamer of the Canadian Government Merchant Marine to go to sea and she left Quebec on January 21st last to go round to Sydney. She was escorted by the Government ice-breaker "Montcalm." The route to the north of Anticosti was chosen, as it was generally conceded that there is less chance of meeting heavily packed ice than on the southern route. The route chosen was most favorable, and the winter was exceptionally mild. In spite of this it took the ships twelve days to get round to Sydney. They were carried 45 miles to the westward on one occasion by heavy ice and were held on another occasion for four days without making a move. The "Montcalm" suffered a damaged rudder and had two propeller blades broken. This necessitated her going into dry-dock at Halifax.

From this it will be seen that the prospects of keeping St. Lawrence ports open all the year round are most remote. The harbor facilities at Montreal and Quebec, representing an investment of many millions of dollars, are thus compelled to stand idle 40% of the year, not only earning nothing, but suffering depreciation. The same thing would occur with the deep water canals proposed. Can the country afford it?

The Weather Bureau

IT has been the privilege of the general public since weather prognostications were inaugurated, to hold the forecasters up to ridicule. If the weather forecast said fair and mild, the careful citizen donned overcoat and rubbers, or at least, contended that was his method of following out the advice. When conversation fell slack during an evening call, airy persiflage anent the mistakes of the weather man could always be depended on to raise a well-bred smile. In spite of all this, the record of efficiency of this much-maligned department is 81.6%.

Gentlemen, how many of you can show such a record? Can the medical man, the lawyer, the preacher, stand up and say that in nearly nine cases out of ten he was right, and bring his record to prove it? We doubt it. Probably only in the ranks of the engineering profession could such a standard be found. In future we shall accord the weather bureau a fuller meed of respect than we have in the past, and use their warnings more in our daily excursions to and fro.

For a long time the waste steam from steam-engines has been turned to good account, but there have been difficulties in the way of using the exhaust gases from a gas-engine as they readily attack the metal of the conduits. However, the difficulty is being overcome, for a New Jersey candy factory has an installation in connection with a sixty horsepower engine which is used to heat the factory. The gases pass through an economizer made of cast-iron, with the passages to the different sections staggered so that all parts are heated for the whole length. Water circulates in jackets surrounding the gas passages.

* * * *

THE assurance of Washington that Canada will not be discriminated against in the matter of coal shows more spirit than the threat to cut Canadian power off United States when it was short here.



Educational Items for Future Officers

A Series of Questions and Answers on Subjects Pertaining to Seamanship—Rule of the Road—The Use of the Chart—These Articles Will Appear Monthly

Continued from last month's issue.

RULE OF THE ROAD

WE want you to give your very special attention to the foregoing remarks and if you will read them over carefully, it will help your memory. As we have said before, there are 32 Articles to the Rule of the Road. We would say that the first 14 articles deal with the lights to be carried and shapes to be exhibited on your vessels. These lights and shapes should have your attention before the vessel leaves port and it is the duty of the inspector of hulls to see to this also, so be ready for him. The fog and sound signals are simple, and are all found in the book and you can only get them from the Rule of the Road Book and if read with attention, they are easy to understand and these signals, (fog sound signals) are deliberately made when necessary, not suddenly in the face of danger so you have time to know and refresh your memory, if forgotten at the moment, for after all, they are precautionary signals. Most of the latter articles are to be used in the face of danger, that is, when there is risk of collision and you could therefore call them "articles of action," and you will allow that they require our best and most careful attention. To put it another way we would say that the vessels fall into two divisions—steamer vessels and sailing vessels, and here I would refer you to preliminary of article 1 of the Rule of the Road. Then, in looking up and reading the rule of the road relating to steam vessels they are more simple than the rules relating to sailing vessels as they are not complicated by the wind. Those in charge of a steam vessel must remember, 1st—In what direction the OTHER vessel is going, 2nd—If there is any risk of collision, 3rd—If there IS RISK, what article is involved. If in a sailing vessel, he must know, 1st—In what direction the OTHER vessel is going (same as when on a steam vessel), 2nd—How the other vessel has the wind, 3rd—If there is risk of collision (same as when on a steam vessel) and 4th—What article is to be observed and in this case I would refer you to article 17 (a) and (b), and we also remember article 27. Now, we see a vessel, and our first thought is which way is she going and it may be by day or by night; by day, we can see when vessels are close enough to involve danger of collision, the bow, the side or the stern of the other vessel can be seen, and in the case of a sailing vessel, the trim of the sails and the direction of the wind, help to tell in which direction she is sailing. By night—in the dark the hull of the vessel is obscured, but colored side lights are so fixed and secured that a green light indicates the starboard side and a red light the port side. Here I would refer you to article 2 (b) and (c). Therefore, the direction of a vessel is to be known by the side or the lights of the vessel which we see. It might be well to draw your attention to the lines, which, by the way, were written by Sir Thomas Grey:—

Green to Green and Red to Red,
Perfect Safety, Go Ahead.

We would see that opposite colored lights indicate crossing vessels, and same colored lights indicate passing vessels. Now, let us for one moment ask ourselves, what do we take the sidelights to indicate (many have perhaps not given this a thought)? 1st, they indicate a vessel under way, and 2nd, crossing ahead, or passing without danger of collision. Do not forget, in these days of nearly all steamers, that if you see the colored sidelights alone, it is a sailing vessel, but if, in addition to the sidelights you see a white masthead light, it is a steamer. Additional lights are carried by steam vessels, and vessels in special work, they are, pilotage, towing, fishing, cable vessels, a help to some to group our lights and sounds in this way, I think. Again vessels anchored or secured in any way do not carry side lights. Keep these points in your mind, they must help us all some time. Here I might say that article 2, sections b, c, and d, tell us that the side lights should be constructed and screened to show a clear unbroken light over an arc of the horizon of 10 points, and so fixed as to throw the light from right ahead to two points abaft the beam and if your lights are fitted and screened in this, what we will call limited way,

they tell us nearly a steamship's course within ten points. A sailing vessel may have a similar range with a free wind, or she may be limited to one course, when close-hauled. I would remind you that the compass bearing of a light is of the greatest importance, because it tells us WHEN THERE IS RISK OF COLLISION and enables us to fix nearly the spot towards which both vessels are making, which I will tell you is the point of intersection of the two vessels' courses, and we can call those points, "the point of collision." I would say here that the information given us by the screening of lights are not so important as the compass bearing, but do help your judgment. At one time, the 10 point bearing used to take our first thought or should, but you will notice the preliminary to article 17, which was added in the year 1897 to the old articles (we are all learning) and those that wrote this preliminary knew what they were doing. We do not know if we care to hear the highest idea of naval men, regarding the rule of the road, but there was once a vice-admiral who wrote about the "two bearings," and he said: "If the plan of taking two bearings with an interval between them will not answer, no other plan will."

These lights are made in such a manner that the light or glass part only shows or exposes 10 points of the compass, the remainder being shut out by the casing. These lights of course are made in various sizes (diameter) for large and small vessels, but they should all be constructed on the same principle, that is to show only 10 out of the 32 points of the compass. In order to prevent these side-lights from being seen across the bow the said green and red lights are fitted with in board screens prolonged at least three feet forward from the light. The manner of fixing these colored lights should have your careful attention. They will require to be fitted each with a screen on the in board side and close to the light in order to prevent both being seen at the same moment from any direction but that of right ahead and two points abaft and beam. This is important, for without the screens any plan of bow lights would be ineffectual as a means of indicating the direction of steering. The information given by these lights, with the signals by whistle as provided, is all that is required to enable vessels to pass each other in the darkest night with almost equal safety as in broad day. Remember, so long as both the colored lights of each boat are visible together they are meeting head and head or nearly so, passing whistles are blown for sides and the course of each altered according to agreement. If only the side light of one vessel is seen by the other the one observing it notes its bearing and from his own course is able to form a very good idea as to the course the other fellow is steering. A couple of bearings of the light in this way taken at short intervals will disclose whether the light is drawing ahead or astern. As an illustration roughly, just note the bearing of a side light as soon as seen; reverse the bearing, that is, we will say, if the direct bearing is north north-east its reverse direction would be south south-west. Then if it be a green light allow ten points to the right for the arc of visibility over which the light shows. Having taken the bearing of a sidelight, it is desired to know if there is any danger of collision and to determine this you should take a second bearing, and irrespective of your speed, relative position of light, and observer, if the second bearing be the same as the first taken the point of collision is at once determined and of course you would take the proper action. If from the second bearing taken the light has altered so as to be drawing more astern, there will be no danger of collision for the observer will pass ahead of the light, and both vessels can maintain their course and speed. If it is found that the bearing of the light has altered so as to draw more ahead, therefore the light will pass ahead of the observer and under ordinary circustances there would be no danger of collision. If the course of each are so as to involve risk of collision one must give way to the other, depending upon the position of each, and which has the other under her own STARBOARD side. I would ask you to always associate the color green with Starboard and the color red with Port. You should remember the helm signals to be blown by steamers for meeting and passing each other in safety. One blast of the whistle means to direct your course to Starboard, that is, port your helm, or port; two blasts of the whistle means direct your course to port, that is, starboard your helm or port. Or again, one blast means I am directing my course to starboard; two blasts to mean I am directing my course to port. When two steamers are approaching one another head and head or nearly so, it shall be the duty of each steamer to pass to the right or port side of the other and those in charge of either steamer may be first in determining to pursue this course and therefore and thereupon generally gives the signal of his intention, one short and distinct blast of his whistle for the one in charge of the other steamer to answer promptly by a similar blast of his whistle, and thereupon such steamers shall pass to the right or port side of each other. But if the course of such steamers is so far on the starboard of each other as to not be considered as meeting head and head or nearly so the person in charge so first deciding shall immediately give two short and distinct blasts of his whistle shall answer promptly by two similar blasts of his whistle and they shall pass to the left or on the starboard side of each other. There may be exceptions of course to this, but take it in a narrow channel where there is a current when two steamers are meeting it is understood the descending steamer shall have the right of way, and shall before the vessels shall have arrived within the distance of about one-half mile of each other, give the signal necessary to indicate which side she elects to take. I will repeat this here that in the night time steamers will be considered as meeting head and head so long as both the colored lights of each are in full view of the other, or by day when each steamer sees the mast fo the other in line or nearly in line with their own. Of course, we are supposing that the vessels of which we are talking at the moment each has more than one mast.

Then we have, when steamers are approaching each other in an oblique direction so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way of the other, which latter vessel shall keep her course and speed. The steam vessel having the other on her starboard side indicates by one blast of her whistle her intention to direct her course to starboard, and two blasts if directing her course to port, to which the other shall promptly respond; but the giving and answering signals by a vessel required to keep in her course shall not vary the duties and obligations of the respective vessels. By this I mean that the steamer which has the right of way merely responds or answers, the helm, signals of the steamer which is to keep out of her way in order that both may have an understanding of such intention. The steamer which has the right of way holds her course and speed, and is not controlled by the helm signals of the steamer that is obliged to go clear. The steamer which is to keep out of the way of the other is first to give the helm or course signals. Remember, when steamers are approaching each other and those in command of either vessel fails to understand the course or intention of the other, whether from signals being given or answered erroneously, or from any other cause, the one so in doubt shall immediately signify the same by giving several (five or more) short and rapid blasts of the whistle, and if the vessel shall have approached about within half a mile of each other, both shall be immediately slowed to a speed barely sufficient for steerage way until the proper signals are given, answered, and understood, or until the vessels shall have passed each other.

I would ask you to remember that I am putting this somewhat in my words as helps to memory, and remember that the law says, "Vessels approaching each other from opposite directions are forbidden to use what has become known by some as (cross signals) answering one whistle with two and answering two whistles with one." In all cases and under all circumstances those in charge

of a vessel receiving either of the whistle signals, provided in the rules, which for any reason he deems injudicious to comply with, instead of answering it with a cross-signal must at once observe the provision of this rule. If the pilot or those in charge of a steam vessel to which a passing signal is sounded deems it unsafe to accept and assent to set signal, he shall not sound a cross signal, but in that case, and in every case where the pilot of one steamer fails to understand the course or intention of an approaching steamer, whether from signals being given or answered erroneously, or from other causes, the pilot of such steamer so receiving the first passing signal, or the pilot so in doubt shall sound several short and rapid blasts of the whistle, not less than four, and if the vessels shall have approached within half a mile of each other, both shall reduce their speed to bear steerage way and, if necessary, to stop and reverse. I have, perhaps, repeated myself here, but I wish to aid your memories.

We understand it is often necessary to change the helm signals given, either by one steamer or by both steamers in order to prevent possible collision. We will take an example. Supposing that in a narrow channel, this time no current, with the wind blowing directly across it and a steamer with a tow meets another steamer. The second steamer is first to blow for sides, but the side indicated by such signal is not favorable for the steamer with the tow to pass on by reason of having to hug the lee bank instead of keeping the windward one close aboard. The one in charge of the steamer with the tow desires to pass on the other side from the signal first given, but in doing so he does not blow a cross signal or whistle, but blows an alarm signal first, and then the helm signal for the side he desires to pass on, to which the other steamer assents or agrees. Then, again, sometimes it happens that the steam whistle of one steamer cannot be heard by the other. When in doubt the alarm signal should be sounded and then the helm signals blown. Of course, there are also cases where it is necessary to change signals but in no case is a cross signal to be blown until the alarm signal is first sounded. Then, again, whenever a steamer is nearing a short bend or curve in a channel where from the height of the bank or other cause a steamer approaching from the opposite direction cannot be seen for a distance of half a mile, the pilot of such steamer, when he should have arrived within half a mile of such a bend or curve, shall give a signal by one blast of the whistle, which signal shall be answered by a similar blast given by the pilot of any approaching steamer that may be within hearing. Should such a signal be so answered by a steamer upon the further side of the bend, then the usual signals for meeting and passing must be immediately given and answered, but if the first alarm signal of such pilot be not answered, he is to consider the channel clear. When boats are moved from their docks or berths and other boats are liable to pass from any direction toward them, they shall give the same signal as in case of boats meeting at a bend, but immediately after clearing the berths so as to be fully in sight they shall be governed under the rules of steamer approaching. The signals by the blowing of the whistle shall be given and answered by pilots with these rules, not only when meeting head and head but at all times when passing or meeting at a distance within half a mile of each other and whether passing to starboard or to the port. Nothing in these rules shall exonerate any vessel or owner or master or crew thereof from the consequences of any neglect to carry lights or signals, or of any neglect to keep a proper lookout, or of the neglect of any precaution which may be required by the ordinary practice of seamen or by the special circumstances of the case. Nothing in these rules, mind you, shall interfere with the operation of the special rule duly laid down, duly made by local authority, relative to the navigation of any harbor, river or inland water.

Preliminary—Risk of Collision

Risk of collision can, when circumstances permit, be ascertained by carefuly watching the compass bearing of an approaching vessel. If the bearing does not appreciably change such risk should be deemed to exist.

Two Sailing Vessels Meeting

Article 17.—When two sailing vessels are approaching one another, so as to involve risk of collision, ONE OF THEM SHALL KEEP OUT OF THE WAY of the other, as follows, viz.:—

(a) A vessel which is running free shall keep out of the way of a vessel that is close-hauled.

(b) A vessel which is CLOSE-HAULED ON THE PORT TACK shall keep out of the way of a vessel which is close-hauled on the starboard tack.

(c) When both are running free, with the wind on different sides, the vessel WHICH HAS THE WIND ON THE PORT SIDE shall keep out of the way of the other.

(d) When both are running free, with the wind on the same side, the VESSEL WHICH IS TO WINDWARD shall keep out of the way of the vessel which is to LEEWARD.

(e) A vessel which has THE WIND AFT shall keep out of way of the other vessel.

Two Steam Vessels Meeting

Article 18.—When two steam vessels are meeting end on, or nearly end on, so as to involve risk of collision, EACH SHALL ALTER HER COURSE TO STARBOARD, so that each may pass on the port side of the other.

This article only applies to cases where the vessels are meeting end on, or nearly end on, in such a manner as to involve risk of collision, and does not apply to two vessels which must, if both keep to their respective course, pass clear of each other.

The only cases to which it does apply are, when each of the two vessels is end on, or nearly end on, to the other: or in other words, to cases, in which, by day, each vessel sees the masts of the other, in line, or nearly in line, with her own; and by night, to cases in which each vessel is in such a position as to see both the sidelights of the other.

It does not apply, by day, to cases in which a vessel sees another ahead crossing her own course, or by night, to cases where the red light of one vessel is opposed to the red light of the other, or where the green light of one vessel is opposed to the green light of the other, or where a red light, without a green light, or a green light without a red light, is seen ahead or where both green and red lights are seen anywhere by ahead.

Two Steam Vessels Crossing

Article 19.—When two steam vessels are crossing, so as to involve risk of collision, the vessel which has the other on her STARBOARD SIDE shall keep out of the way of the other.

THE International Association of Ash Sifters have officially opened the 1919-20 season. The slogan: "Dust thou art to dust returnest."

* * *

IMAGINE the good old days when a machine tool dealer could give you delivery in two weeks—and then was willing to stand back a spell and wait for his money.

* * *

MANY a salesman is successful on account of the things he does not say rather than for the things he does say.

* * *

SHORTER hours and less production will never remedy the condition this country faces. It is bound to mean lower wages and unreliable employment. The high mark for wages in Canada was in the munition shops, and those wages were possible on account of the high production secured.

An Interesting Account of the Craggs & Isherwood Case

THE long trial of this action has ended after thirty-seven days in the Chancery Court before Mr. (now Lord) Justice Younger. The action is between two men who had in their possession a really wonderful invention —the one the inventor, the other the business man of vision who saw in the invention a means of reducing the cost of transport by sea to such an extent that shipowners were willing to pay as much as 5 dols. per gross ton for permission to use it. Alas! it would appear that the royalties which should have accrued in equal shares to each is being poured into the pockets of legal gentlemen at the rate, it is said, of not less than £1,000 per day. The total cost of the litigation, Dame Rumor puts at well over £100,000.

The facts of the case seem to be as follows. In the early part of 1906 Mr. Isherwood had developed a system of ship construction which in principle and arrangement was entirely different from any system previously devised. He had prepared drawings of his system, and had secured the general approval for them of Lloyd's Register of Shipping, in whose office Mr. Isherwood was then serving. These drawings were shown to Mr. Craggs, who was the managing director of R. Craggs and Son, of Middlesborough, and saw that the system was one of great promise. Isherwood had provisionally secured his invention at the British Patent Office, and after some discussion, during which Mr. Craggs offered to build the first ship (eventually the Paul Paix) to his system, Mr. Isherwood entered into an agreement with Mr. Craggs, by which he was to resign his position at Lloyd's Register, and devote his whole time to the development of the invention. Mr. Isherwood was to be guaranteed a minimum salary of £500 per annum and a half share of the royalties for 14 years.

Whilst preparing the complete specification for filing in the British Patent Office, search revealed a number of patents which were thought to bear upon the Isherwood construction, and one in particular thought to be of some importance was that by Lilliehook, a lecturer in (now a professor of) naval architecture, at Stockholm, who had filed a specification in Sweden in 1903, and in Great Britain in 1904. Mr. Craggs was of the opinion that the specification was important. Mr. Isherwood, on the other hand, did not attach so much importance to it, being firmly of opinion that his invention was unassailable by Professor Lilliehook. Mr. Craggs decided to buy the Lilliehook patent if he could get it cheaply, and eventually gave for it £30 down, and after five years he was to give Professor Lilliehook one-halfpenny per ton on all vessels built to the Lilliehook construction. This step, it is alleged, was taken in order to protect the Isherwood patent, in which each of the litigants participated equally. Mr. Isherwood was no party to this agreement with Professor Lilliehook.

Time passed, the first vessel was completed, and proved a success. Mr. Isherwood and Mr. Craggs entered into further agreements, by which Mr. Isherwood received shares in R. Craggs and Son, and became a director, acting as assistant managing director to the firm. Unfortunately this firm went into liquidation in May, 1920, and to satisfy the creditors a mortgage on the Isherwood royalties was arranged. Mr. Isherwood subsequently, by agreement, was given full charge of the Isherwood patents. He alone could grant licenses, but Mr. Craggs or the mortgagees were still to have one-half of the royalties. Thus circumstances had arisen by which, through the financial difficulties of Mr. Craggs, Mr. Isherwood came by agreement with the trustees appointed in the liquidation, to have charge of the Isherwood patents. He, however, still had nothing to do with the Lilliehook patent, which Mr. Craggs had purchased and was seeking to obtain sanction by the U.S.A. Patent Office. It is alleged that he (Cragg) had undertaken with his trustees and Mr. Isherwood, to take no steps in America with that object, and was therefore acting contrary to his agreements.

The Lilliehook patent was Mr. Craggs' property, and it is alleged that he introduced or attempted to introduce into the Lilliehook specification in America phrases which would have the effect of embodying the Isherwood invention in Lilliehook. In particular, through or by Mr. Cragg's agent it was sought to establish a direct connection of the transverse frames to the skin of the ship, one of the essential features of Isherwood and one not, it is alleged, present in Lilliehook. The U.S.A. Patent Office would not sanction the proposed modifications. Had these attempts been successful, the Lilliehook patent would, in the U.S.A., have been held to anticipate Isherwood. Mr. Isherwood would receive no royalties on his construction, but royalties would be paid on the Lilliehook patent. On one side it is alleged that these attempts were made with the object of destroying Mr. Isherwood's chance of getting a patent in that country. On the other it is stated that they were made with the object of protecting the holders of the Isherwood patents. The Lilliehook arrangement was patented in 1910 after assignment by Mr. Craggs, the purchaser, and his wife.

Mr. Isherwood himself was trying to get his patent through in America, and eventually succeeded in 1912, after much argument, and not until the specification had been taken the Board of Examiners in Chief for final decision. The principal citation in opposition to Mr. Isherwood was the Lilliehook patent.

In 1915, Mrs. Craggs, through her agent in America, and it is alleged through her husband, the defendant in the counter-claim in this action, sought by making an application by the recognized methods of the U. S. Patent Office, to set up an interference which would have the result, if successful, of destroying the patent granted to Mr. Isherwood in 1912. Here again, it is alleged that Mr. Craggs, though acting for his wife, to whom he had assigned the patent, was acting contrary to his agreement with Mr. Isherwood that he would do all he could to benefit the Isherwood invention. On the other hand, it is alleged that in proceeding with the Lilliehood application the Isherwood invention would be placed on a more secure foundation, and also that Mr. Isherwood, being no party to the purchase of the Lilliehook invention, Mrs. Craggs had a perfect right, and her husband acting for her had also a perfect right to prosecute the application, even though it should result in destroying Mr. Isherwood.

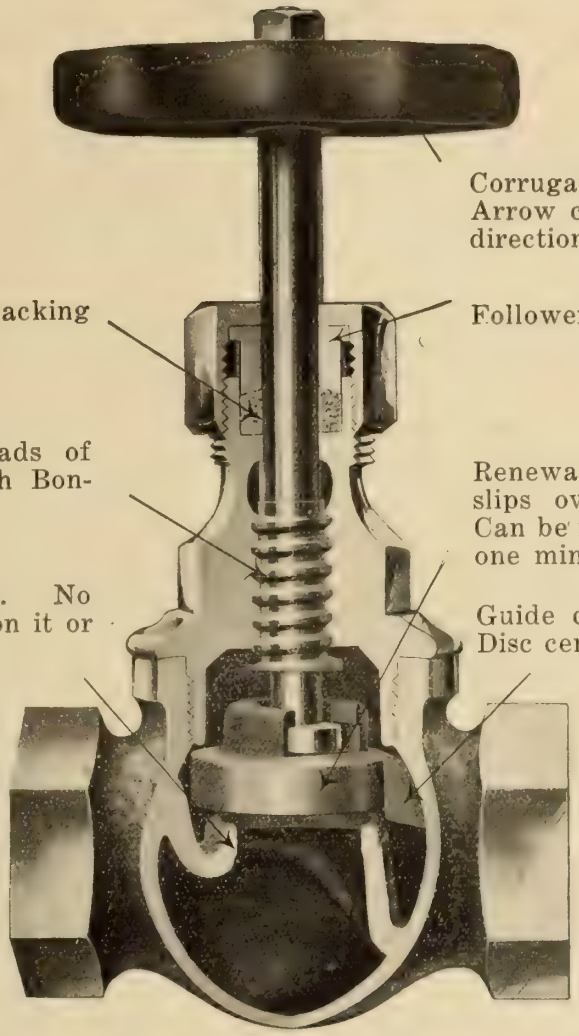
In 1916 Mrs. Craggs assigned the Lilliehook patent rights to a company of which she was principal shareholder, and in which her husband had no share; but Professor Lilliehook himself was a shareholder. It appears that Professor Lilliehook, aware of the great success of the Isherwood system, was anxious to secure the halfpenny per ton on all ships built to the Isherwood system on the grounds that he himself was the real inventor of that system, and was entitled to the royalties which Mr. Craggs and Mrs. Craggs had agreed to pay him. He was therefore admitted to the company. This company still continued to prosecute the Lilliehook application in America, just as Mr. Craggs had been doing previously. It is alleged that Mr. Craggs, though not the owner, and though Mrs. Craggs was not the sole owner of the patent, still continued to assist in the prosecution of the Lilliehook application, and thereby violated his agreements with Mr. Isherwood.

This action is brought by Mr. Craggs and Mrs. Craggs against Mr. Isherwood and Craggs' Trustees, because Mr. Isherwood, having learned what was taking place in America, refused to pay over the moiety of the royalties from the Isherwood system in Great Britain. There is a counterclaim, in which Mr. Isherwood sues Mr. Craggs for causing, by his actions in America, first, delay in the granting of his patent, and, second, damages because of the effect upon shipbuilders in America who are refusing to pay royalties. The action wil be settled on the counterclaim.

The case seems to be a difficult one, from a legal point of view, and will turn upon the extent or scope of Mr. Craggs'

Continued on page 50.

Fairbanks Renewable Disc Valves



Corrugated Iron Wheel, Arrow cast on wheel shows direction valve opens.

Palmetto Twist Packing

Follower in stuffing Box.

At least Four Threads of Spindle engaged with Bonnet at all times.

Renewable Bakelite Disc slips over end of spindle. Can be replaced in less than one minute.

Raised Round Seat. No Sediment can lodge on it or injure disc.

Guide cast on Body holds Disc centrally over seat.

Globe or Angle

Screwed or Flanged.



The disc of the Fairbanks Renewal Disc Valve can be renewed in less than a minute without removing the valve from the line, a wrench being the only tool necessary.

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MARINE NEWS FROM EVERY SOURCE

St. John, N.B.—The new dry dock which is being built at Courtenay Bay, St. John harbor, will be, when completed, the largest dry-dock in the world. It will take two and a half years to complete.

Victoria.—Premier Oliver of British Columbia, after hearing the representations of a delegation of returned men, wired to Hon. Dr. S. F. Tolmie, Federal Minister of Agriculture, urging that the Government place orders for wooden ships in B. C. and proceed with other public works.

Cobourg. — One of the coal ferries plying between Cobourg and Charlotte was damaged at the latter port, and was unable to make the trip across. Mr. Harrington, Provincial Fuel Commissioner, said that arrangements would have to be made to ship the coal to Toronto by way of Black Rock.

Ottawa.—Recommendations for improvements to Vancouver harbor, presented to Mr. Ballantyne, include a modern 1,300-foot wharf on Burrard Inlet, a car ferry service between Vancouver and North Vancouver, and a terminal railway system. The improvements would run into several million dollars.

Port Arthur.—A wireless was received from the steamer "Collingwood" that she had been forced to go for shelter behind Kewwanaw Point. A severe storm was raging on Lake Superior and several other boats were also seeking shelter at the same time. The weather at the time was quite fine at Port Arthur.

Sault Ste. Marie.—There were several big freighters caught in the ice in Mud Lake recently, a most unusual occurrence for the time of the year. Mud Lake is just below Sault Ste. Marie. The vessels were the "Martian," "W. Grant Morden," "Odanah" and "Midland King." A tug was necessary before they could be released.

Ottawa.—The Government have now received and commissioned eighteen of their fleet, and they will have before the end of the year twenty-two in active service. The "Canadian Aviator," built in Vancouver, will shortly leave for Australia with a cargo of paper, and the "Canadian Volunteer" and "Canadian Trooper" have sailed for Great Britain by way of the Panama Canal.

Ottawa.—The two ships recently ordered from the Wallace Shipbuilding Co. in Vancouver, bring the Dominion Government fleet up to fifty-seven ships. There are about 20,000 men employed in the various yards of the country and there are about the same number employed in the contributory trades. Canada has an investment of $47,000,000 in her shipyards. The two latest vessels are of 8,350 tons.

Goderich. — The steamers Martian, Midland King, Osler, and Hagarty, have been diverted to Goderich to unload and lay up for the winter. All other Georgian Bay and Lake Erie ports are frozen up. A good many boats have already arrived and discharged their grain cargoes at Goderich, and moored for the winter, so there will be plenty of room for the late arrivals.

New York.—The people of the Eastern states are not feeling very kindly towards the move to deepen the St. Lawrence canals and open up the lake ports to ocean navigation. They are of the opinion that such a move would be to the detriment of the Atlantic ports of the U.S. and a benefit to Canada only. This is not in accordance with their wishes, and they will oppose strenuously any participation by the United States Government.

Ottawa.—The "Canadian Recruit" was the last vessel to leave Montreal for the season of 1919 with a cargo. The "Canadian Planter" is still at Vickers' yard, but will be completed and sent down to Quebec to be loaded. The Elder-Dempster liner "Bassa" is still ashore, and the work of lightening her is proceeding. Fear is entertained that she may be compelled to remain in the river all winter if not speedily floated.

Quebec.—A seizure has been filed on the Canadian Government steamer Canadian Trapper by the Tidewaters Shipbuilding Company of Three Rivers. The respondent in the case is the Davie Shipbuilding Company of Quebec, who have not yet delivered the vessel to her owners. The action arises out of a claim for $180,000 for machinery and other work performed by the Tidewater Company.

Cheboygan, Mich.—The fishing tug Rideout was sunk through the ice cutting through her planking, and her cargo is a complete loss. The dummy light at the entrance to the river is now out of operation, and the keeper, Charles Luoisignan, who has been marooned, has come ashore. Martin's Reef lightship came in for coal, and afterwards left for Spectacle Reef and Poe Reef to bring the crews and lightships ashore.

Vancouver.—The first of the four steamers being built in the Coughlan yard for the Canadian Merchant Marine was launched successfully. She is a vessel of 8,100 tons, and was christened the "Canadian Importer." The sponsor was Mrs. Cooper, the wife of the Federal member for South Vancouver. She will be the first vessel of the Canadian Merchant Marine to take the regular sailings for Australia.

Port Arthur.—The steamer Glenlyon of the Great Lakes Transportation Company arrived at Port Arthur later in the season than any steamer has ever arrived from the East. She was five days making the trip from the Soo, keeping the north shore close aboard and being in touch with Port Arthur by wireless during the whole run. The temperature varied from zero to 35 below, the result being the deck cargo is frozen solid and will have to be dug out.

Hamilton as an Ocean Port.—An association known as the Canadian Deep Waterways and Power Association, has been formed. The object of the association is the promoting of the shipping interest of the ports, and important developments are expected from their activities. The Board of Control of Hamilton are considering a request for a contribution to the funds of the association. Plans for the development of the Hamilton waterfront are nearly ready for presentation to the Board of Control.

Sault Ste. Marie.—Five bodies of the crew of the ill-fated Myron have been picked up above Salt Point in Whitefish Bay. This is after nearly a week's patrol of the north and south shores of Lake Superior and Whitefish Bay. No word of their identity has been received as yet. The body of Albert Neilson, deckhand of the steamer Townsend, was found near the centre pier. He fell in the canal some weeks ago while assisting to moor the vessel.

Masters, Mates and Pilots.—The National Association of Masters, Mates and Pilots have joined the Trades and Labor Council. The National Association, which was organized in the States last March, has now eighty-nine harbors, or as they would be called ashore, locals. Montreal, Kingston, Quebec and Toronto have harbors, and many more will be

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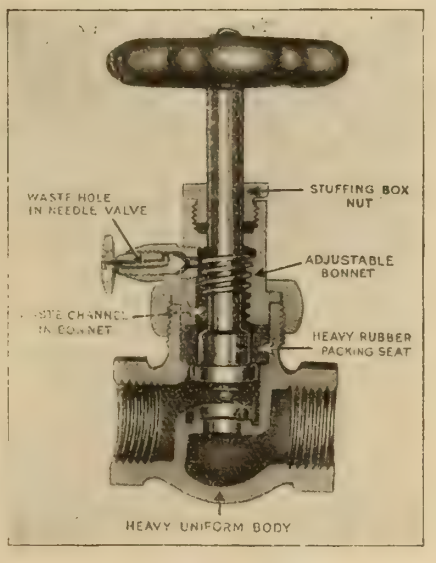
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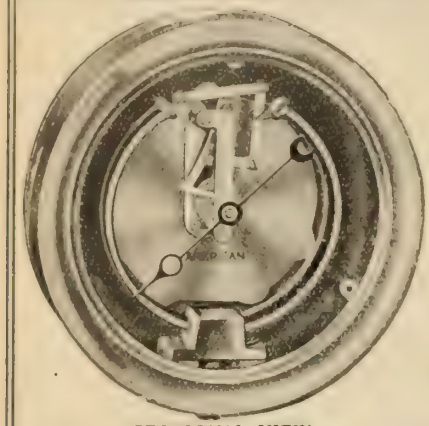
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formed shortly. Capt. W. Stitt is president of Toronto Harbor No. 68. Capt. John Strain, of Buffalo, is business manager of the organization.

Victoria, B.C.—The Marine Department are considering the building of two 75-foot motor boats to supplement its present British Columbia fleet. The work of drawing up the plans has been entrusted to the Cholberg Shipyards.

Port Arthur.—Mr. J. H. Smith will be the new manager of the Port Arthur Shipbuilding Company, replacing Mr. J. F. Paige. Mr. Smith has not yet arrived in Port Arthur, he being detained in Cleveland owing to the illness of a brother.

To Take 50 Per Cent. of Space.—The British Ministry of Shipping, according to a report current in shipping circles, will requisition 50 per cent. of the cargo space of steamers sailing during the month of December. This is an increase of 15 per cent. over the requirements for November. The increase is probably due to the necessity of getting the grain moved over to England and Europe.

Terminals for Sydney, C.B.—In response to a visit of a deputation some time ago to Ottawa, an engineer has arrived here to look over the site for a terminal. A tentative selection has been made at Anderson's Point, and Parliament has voted $100,000 for the building of the wharf and terminal. Mr. Coutlee, the Government engineer, has also been visiting Glace Bay to look over some projected harbor improvements.

Ottawa.—The Canadian Government Merchant Marine will number twenty-three vessels before the end of the year, according to a statement by Mr. Alec Johnson, the Deputy Ministr of Marine. The "Canadian Spinner," "Canadian Planter," "Canadian Settler," "Canadian Rancher," "Canadian Railer" and "Canadian Traveller" will be all delivered before December 31st. The "Canadian Navigator" has been handed over.

Control of Big Fleet.—An agreement has been made with the British Admiralty which definitely places control of the International Mercantile Marine Co. in the hands of the English directors. This agreement states that the company shall make it compulsory that Englishmen manage the ships, and that the directors shall be subjects and residents of the British Empire. The names of new directors must be submitted to the British Government for approval.

Fort William.—The "E. D. Kingsley," built by the Canadian Car & Foundry Co. here, made a successful trial trip recently. The vessel, which is an oil burning freighter, developed a speed of 13½ miles per hour on her trial trip. The Kingsley took on a cargo of 30,000 bushels of grain for Montreal after the completion of the trial, and after discharging this cargo in Montreal, will go in the West India trade for two or three months. She will then proceed to Vancouver by the Panama Canal.

To Open St. Lawrence Navigation.—The experts for the Dominion and United States Governments who are examining the Rivers St. Lawrence and Ottawa, for purpose of submitting report to the International Joint Commission, have got their report ready. It is now in the hands of the Joint Committee for consideration, and meetings will be held soon of all the interested parties on both sides of the St. Lawrence, with a view to action being taken to make the upper reaches of the river and the Great Lakes accessible to ocean-going ships.

Coal Commissioner for B.C.—W. G. Gaunce, of Victoria, has been appointed Controller of Export Licenses for British Columbia. Shipowners requiring

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bunkers for their vessels, if not registered in Canada, must get a license from the controller before they can obtain their requirements. Coal for export must also be licensed. There are only two kinds of licenses issued, the first for coal cargoes destined for U.S. and Alaska points, and the second for bunker coal for ships flying any flag and sailing for any destination, but only for sufficient quantity to take them to the foreign port.

AN INTERESTING ACCOUNT OF THE CRAGGS AND ISHERWOOD CASE

Continued from page 406

obligations to Mr. Isherwood—whether he was a partner, or only a co-owner with Mr. Isherwood.

The evidence in the case has been highly technical, and has been directed mainly to determine the motives of the actions of the parties. That such an action should have arisen in connection with a truly great invention is to be greatly deplored. It is only another notable instance of the necessity where two men entering into business relations conjointly need to be particularly careful in settling the terms of their agreement and the scope of their obligations to each other.—Journal of Commerce.

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To perform its functions properly, a lubricating oil should have body sufficient to keep bearing surfaces apart; should reduce friction to a minimum; should remain fluid at the lowest temperatures to be met in service; should not decompose and form deposits that will gum up the machinery; should have no ingredients which can corrode or pit metal, and should have flash point high enough to insure against the presence of volatile constituents.

To avoid vaporizing too quickly under the high compression heat in an ammonia compressor cylinder, a lubricant must have a good flash, say, 325 deg. F., and as some oil in vapor form is likely to be carried into condenser pipes with the ammonia gas, the cold test should be low enough so that the lubricant will not solidify in the piping and coils—5 to 10 deg. F. If it is carried on through with the liquid ammonia, it can be taken out by an oil trap, placed ahead of the liquid receiver and at the lowest point in the expansion and condenser coils. Such a trap may be made of a piece of 4-in. piping, 2 ft. long, with a draw-off connection at the bottom.

If the lubricating oil gets into the condenser coils and stays there, it can be loosened by cutting off the water from one stand at a time, allowing the coil to become hot, so that the oil is thinned and will run off into the oil trap.

Oil carried over, and collecting in the condenser and expansion coils, is a source of lost capacity, and is frequently due to locating the oil separator

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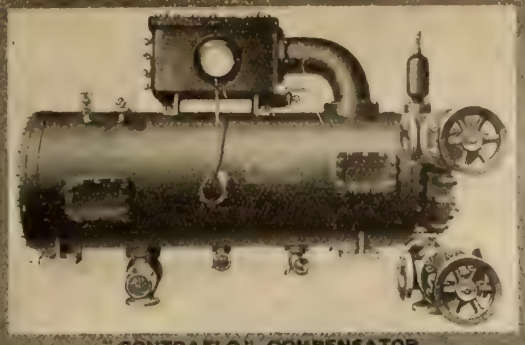
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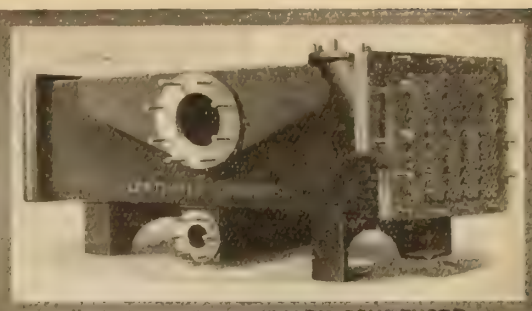
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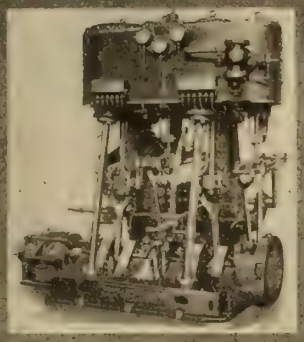


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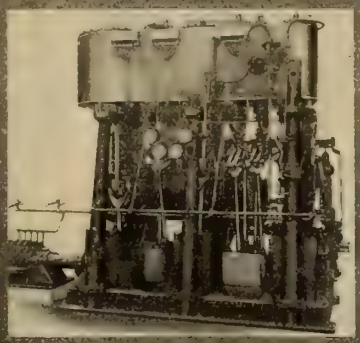


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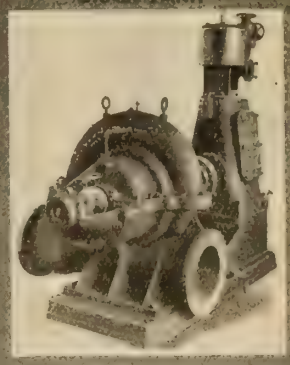
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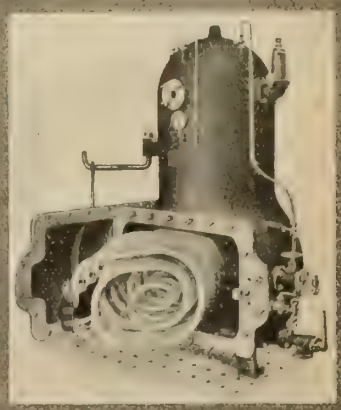
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too close to the compressor discharge, where the gases are hot and the oil mostly in vapor form. Placing the separator near the condenser gives time for the gases to cool somewhat before reaching it, so that the oil is partly condensed and is more readily separated.

All oil used for the compressor cylinder should be measured and a record kept. Any unusual increase in the amount fed should lead to an immediate investigation to prevent filling of the system.

As hot ammonia gas has a bad effect on stuffing box packing, a liberal supply of oil should be applied to the piston rod in the stuffing box to reduce the chance for overheating.

Discoloration in the ice is not always due to oil. Two cases were mentioned in the discussion, one where firebrick was used to fill an open heater in which there were no flow pans, and the mineral matter from the brick carried over into the ice; the other where rust from a fore cooler caused the trouble, which was remedied by painting the inside of the fore cooler.—From a paper and discussion, Nat. Ass'n. Prac. Refrig. Engrs. in "Compressed Air."

Kingston.—The "Canadian Beaver" was launched from the yard of the Collingwood Shipbuilding Company at Kingston, being christened by Mrs. J. B. Foote, wife of Capt. J. B. Foote, of Toronto. The vessel is a full canal-sized freighter for the Canadian Government Merchant Marine. She is 251 feet long, and of 3,500 tons deadweight.

Hamilton.—The steamer "Floretta," which was the first boat to steam through Hamilton harbor at the opening of navigation this season, has been refloated from the shoals of Kelly Harbor. She was stranded there through the receding of the water caused by the heavy wind of a few days ago. She has been in continuous service all season, and has steamed a total of 2,360 miles.

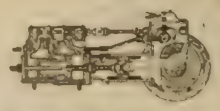
Halifax.—The "Royal George," fitted with an amplifier on her wireless apparatus of the same type that has been heretofore only supplied to warships, has broken a record for wireless telegraphy on merchant ships. She received a message from England when only a few miles off Halifax, this being the first time a merchant vessel has received a message clear across the Atlantic. The "Royal George" is the first merchant vessel to be fitted with an amplifier.

Montreal.—The Elder-Dempster liner "Bassa," which went ashore while clearing harbor on her voyage to South Africa, has been successfully refloated. She was taken into Vickers' floating dry dock for examination and repair, if found necessary. Before she could be floated it was necessary to lighten her of a large part of her cargo, and required the united efforts of a harbor tug and the Government steamer "Strathcona" to dislodge her.

Montreal.—Admiral Jellicoe does not believe that surface ships will be entirely supplanted by submarine and aerial types in the near future. Speaking before the Canadian Club in Montreal, he said he had every respect for the enthusiasm of aircraft and submarine officers, and no doubt it was very tempting to those who held the purse-strings to say "Let's spend no more on the navy." He thought the fact of the Admiralty being about to sell the "Indomitable" was because she was out-of-date.

London.—Owing to the frequency of losses due to floating mines the marine underwriters have been compelled to raise their rates. The rate is now about one-half of one per cent., against one-eighth of one per cent. a few weeks ago. The rates were dropped after a rather long period in which losses were low, but they have been gradually increasing. After the Russo-Japanese war, losses from mines were encountered as long as eighteen months from the conclusion of hostilities.

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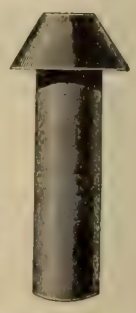
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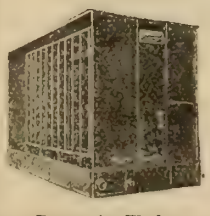

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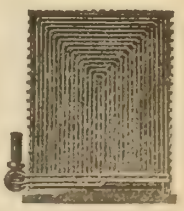

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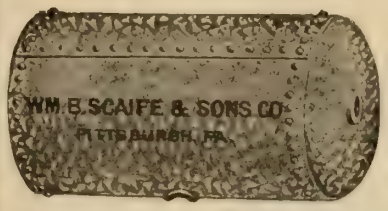
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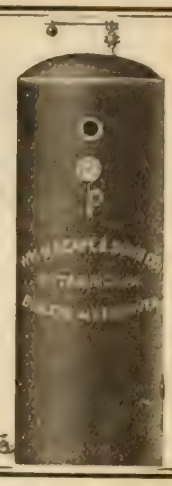


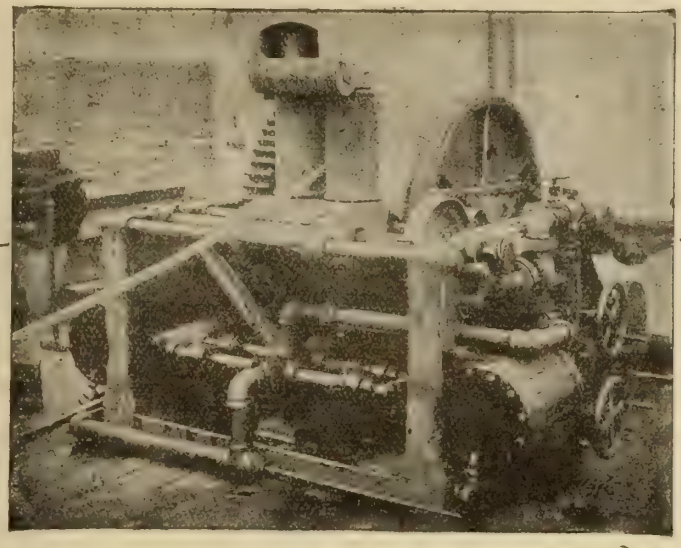
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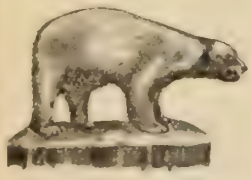
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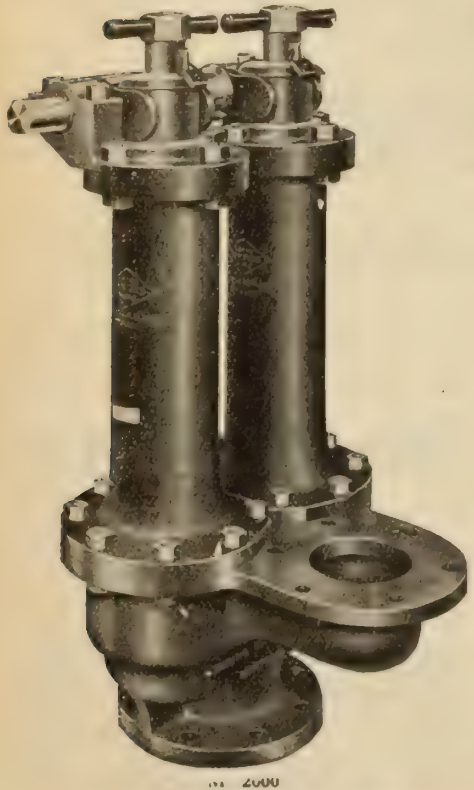
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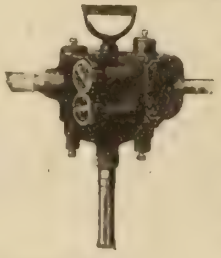
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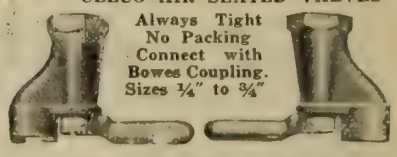
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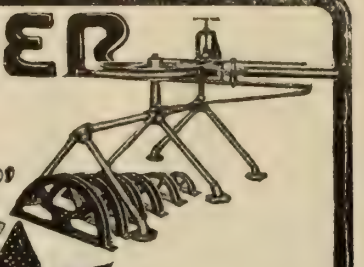
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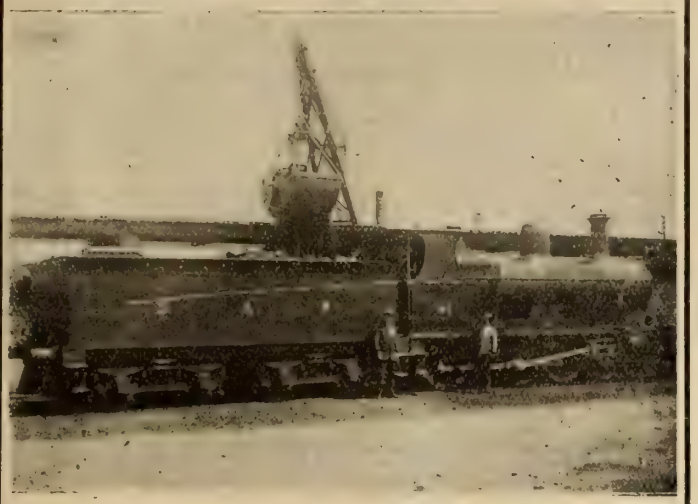
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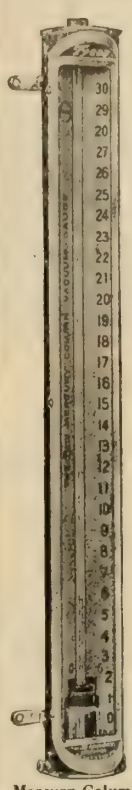


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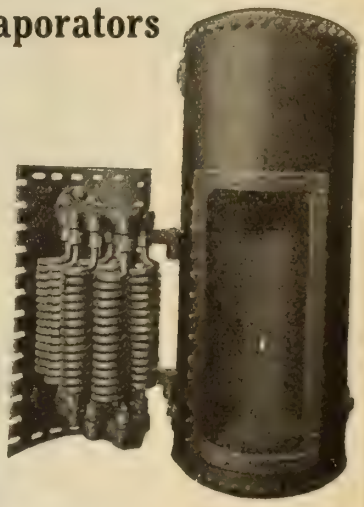
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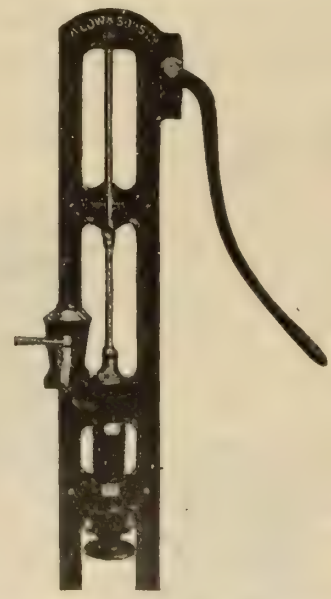
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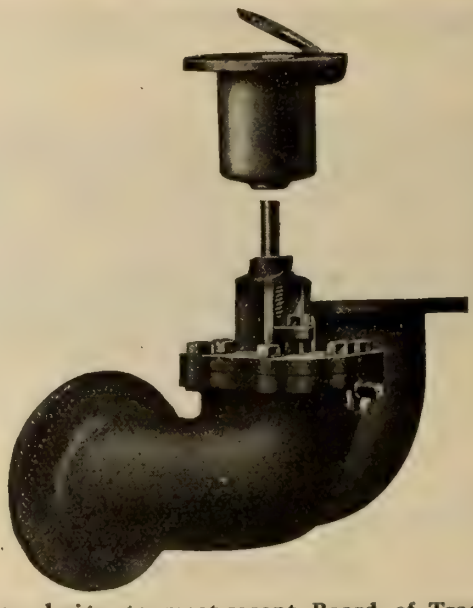
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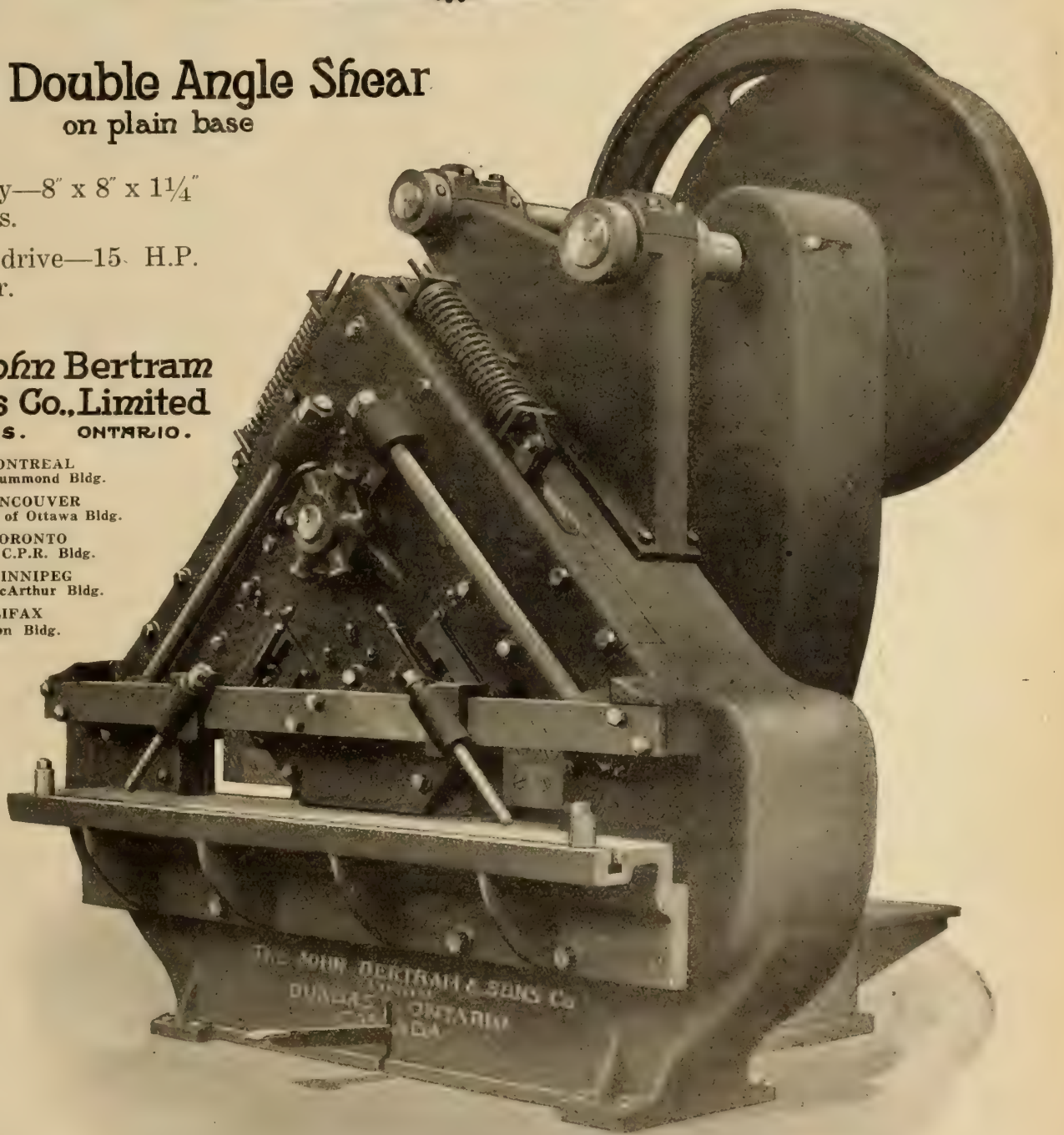
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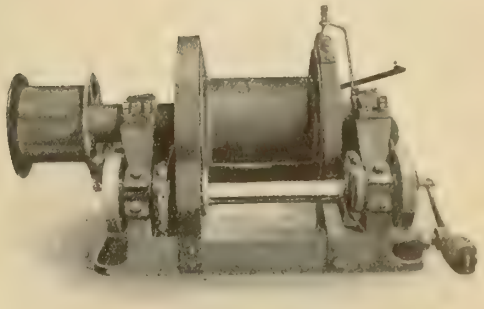


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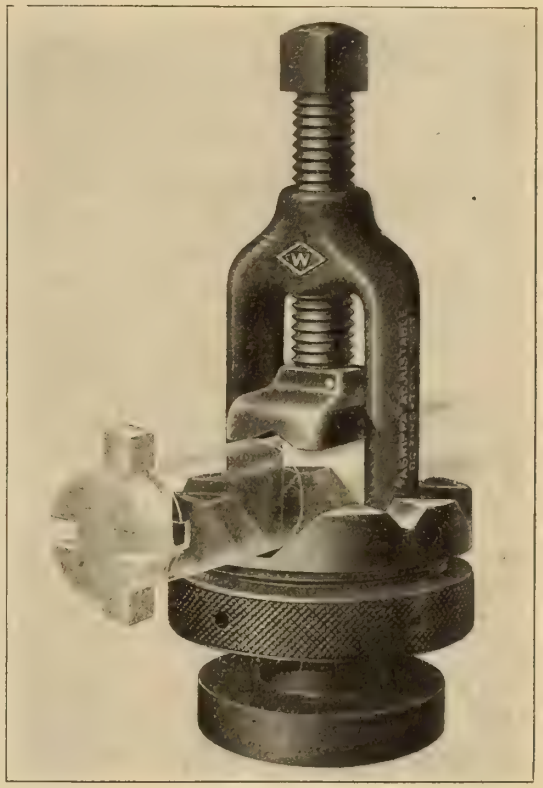
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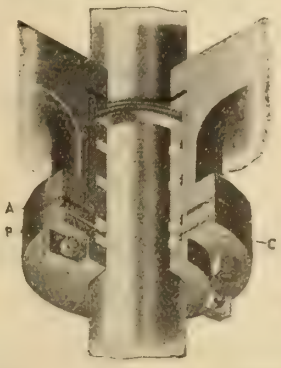
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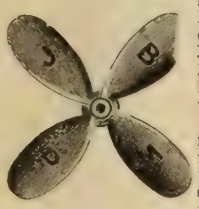
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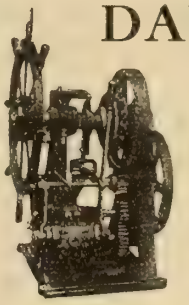
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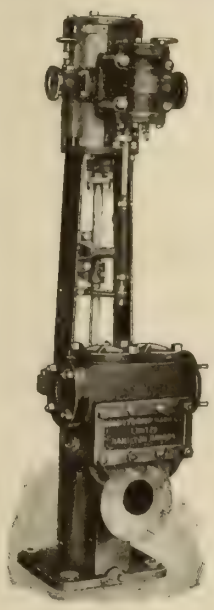
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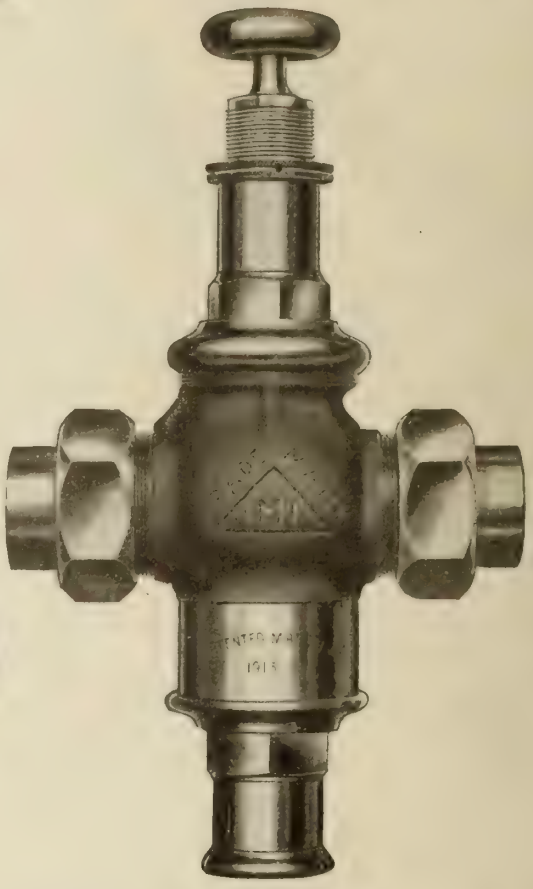
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